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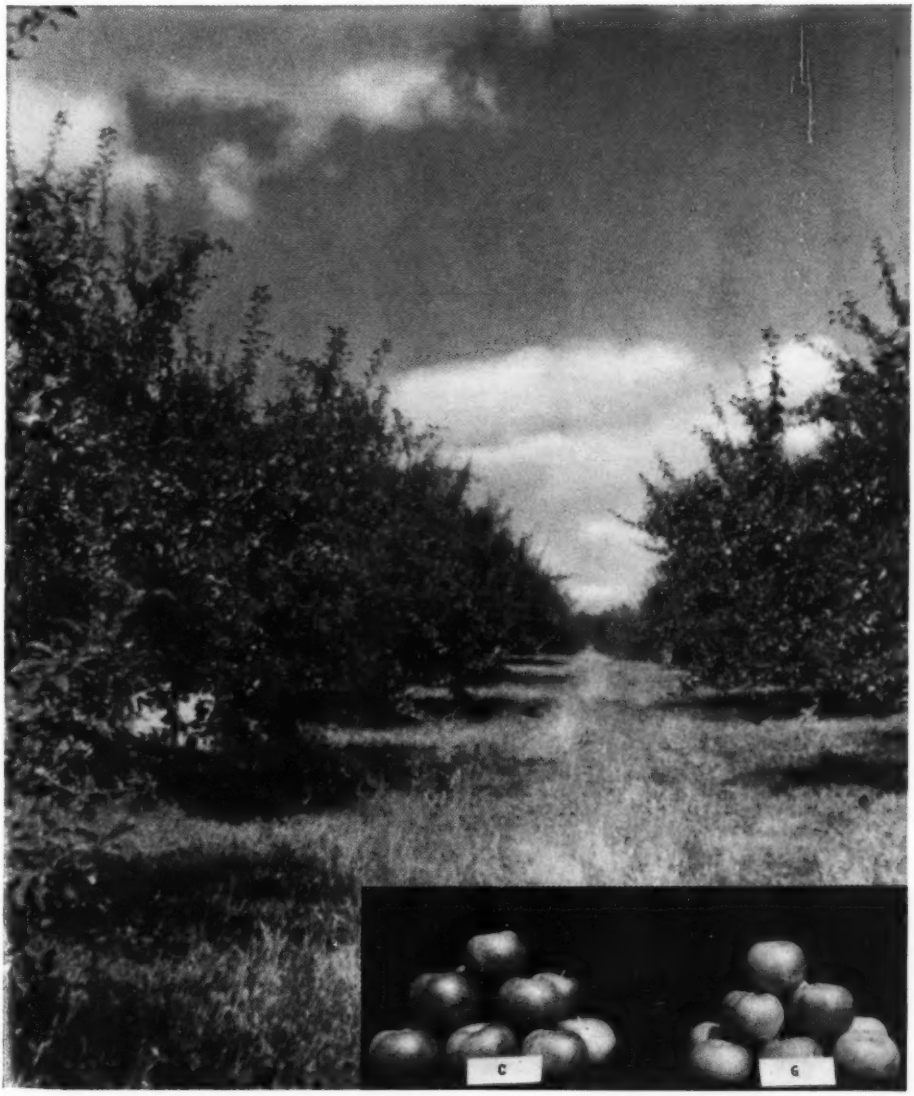

(Turn to page 27)

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXVIII NO. 7

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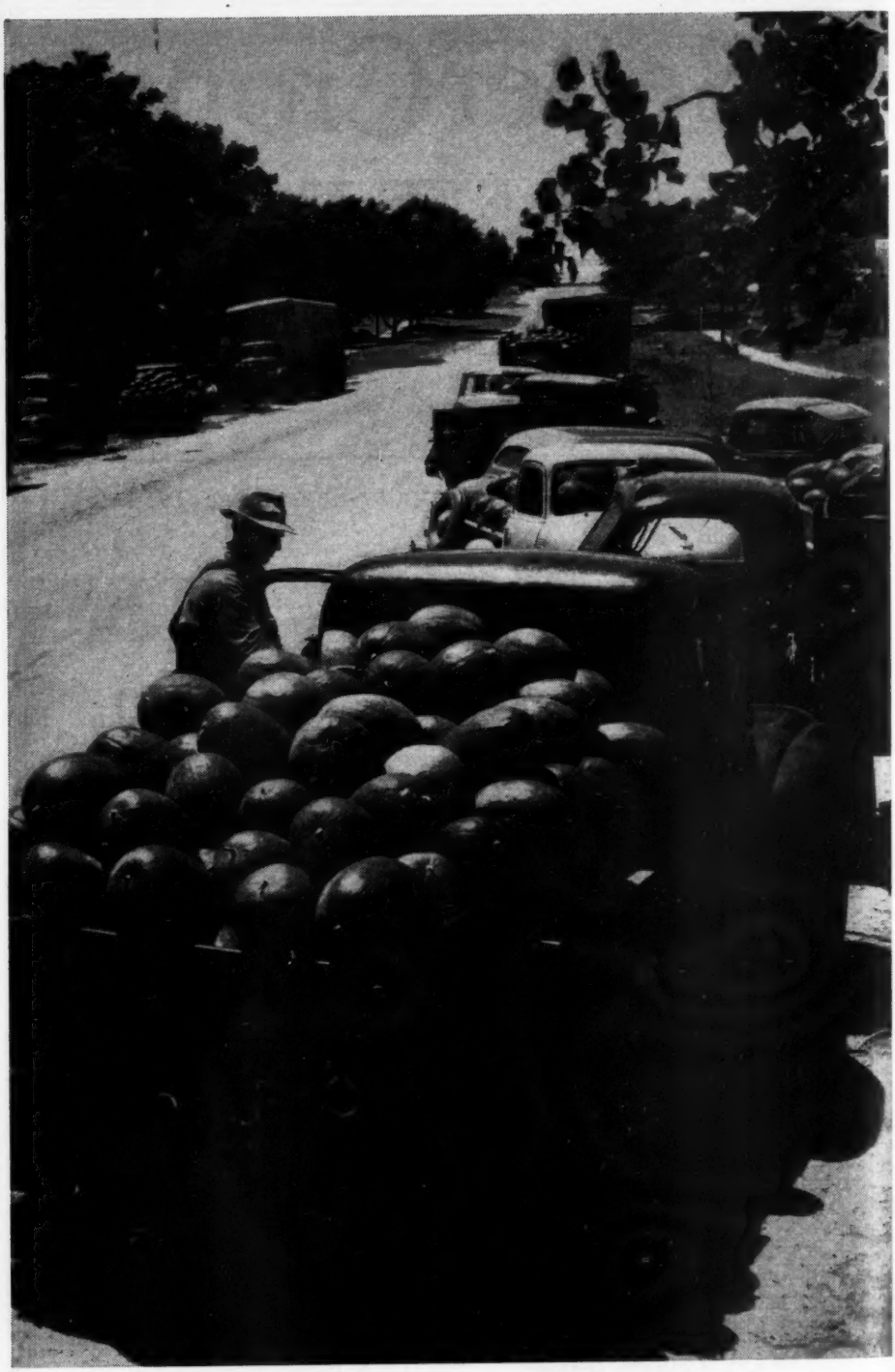

Good Eating on the Way

Better Crops with PLANT FOOD

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VOL. XXXVIII WASHINGTON, D. C., AUGUST-SEPTEMBER 1954 No. 7

Let's have more . . .

Schoolin'

Jeff McDermid

WHENEVER the public schools reopen in the tangy autumn in our old valley, I think of many fine friends and relations of mine who were denied the luxury and necessity of "considerable schoolin'." Most of the girls and fellows of that generation took what schoolin' they could get right handy, as long as it didn't interfere with ambition to be up and doing so that romance might flower without being nipped in the bud. Looking backward now I am sure that all of them would have been far better off as the years lengthened had they braced themselves and put their shoulders to the wheel so as to acquire more education and the advantages that seem to go along with it.

But you have to remember in scanning those long-gone opportunities that much of the education being dispensed in general schools was a little mite like frosting on a cake, which tastes nice while you nibble at it but somehow fails to give you that old substantial nutrition to carry you through the day's grind and turmoil.

Most of us liked our classes in language, history, literature, mental arithmetic, civics, and a tiny dash of what they called science in those times—elemental physics and bad-smelling chemistry. The graduate was provided with a thin layer of the classics, so that we could repeat quite long passages from Shakespeare, Milton, Hawthorne, Washington Irving, Goldsmith, Dryden, Coleridge, Tennyson, and several works on mythology and knight errantry. There's no doubt in my mind

that this was the only possible introduction most of us would ever have received to the sages and poets of the English language. I hold the utmost reverent respect indeed for some of those fine teachers we had, most of them young women with either normal school or college training. I can see them yet, prim and demure, tight-waisted, high-collared, their brows made deep and scholarly by the upright pompadour hairdo of those late Victorian years. Yet betimes they broke forth in girlish merriment at some blundering yokel's innate grasp of literary gems, and we took them to our hearts—we gauche and awkward kids—believing that these rather scared and often lonely kids themselves were the best combination of literature and loveliness we had ever seen.

FEW of us ever realized that these teachers were homesick and often bewildered and discouraged and that they spent long hours "boning up" for the daily ordeals with us. They had plenty to be discouraged about, too, for the wages were very small and chances for advancement often nil. About the only prospect ahead for them was to capture in our valley the heart of some young man beyond school years—and the sad truth is that few of these young teachers were invited into the society circles around us, so dates were doubtful and "pickups" absolutely taboo.

Pray, why is it that we love to clothe the beauties and the marvels of the past—such as these—with rose-hued, mellow, and dramatic touches of tenderness? I think it's because we were young and observing and lighthearted and responsive, seeing the everyday things with wide-open eyes and minds. Much of these attributes and reactions we have since lost in the toughness of the times we have all experienced, leaving behind only those memories in sharp contrast to the skepticism and the critical habits which have too often plowed them under during our mature lives. Those who showed us first where to find that symbolic "Pierian spring" and to quaff its dreamy, unrealistic waters have around their memorable and now vanished faces a certain halo akin to that of the saints—who also have usually been eroded by the floods of urgency and modernity.

I DOUBT if those who taught common schools forty years ago had ever dipped much into the humanities and psychology, or had any form of preparation to help them "get right and solid" with the pupils. Yet many here and there whom I recall most vividly had some inner light and mental radiance which drew and held up youngsters closely, lending strength to the subject matter these teachers handled.

One vigorous lady in particular stands bright and true in my backward thoughts. She was anything but beautiful or physically charming, having a broad, rather muddy and ordinary countenance; and she lacked the frills and accessories to attract attention. However, every morning before classes began and each noon interval her desk was a sort of loadstone for the pupils. She had humor and sympathy, wit and skill, an immense grasp of her subject, and a clear, definite, and logical mind—and she projected herself into the world of the young without evident strain or artificial effort. I don't know where she came from or where she went after leaving us, but in her brief orbit through the realm where we lived she left something sustaining and encouraging to us all.

PROBABLY the sharpest difference then existing as contrasted with the educational field of the recent years was the financial and professional incentives involved. Back when the school bells rang for us, it was generally conceded that anything less than an eighth grade training was undesirable. Beyond that level of learning, the high school course occupied the spot of

the college today—while the taking of terms at an academy or a big university was the goal of perhaps one youth out of ten. In some towns the ratio was far less than that of those who thought it advisable to spend eight or ten years with books and lectures after they finished "grammar school."

To compete with a rising tide of youngsters in other times did not require the breadth nor the depth of studious preparation. There just wasn't as much accumulated knowledge anyhow and the standards for getting and

holding a good-paying job (or a job that offered a career eventually) were seldom hitched directly to a college degree. So universal was the then prevailing idea that degrees were fine but not obligatory, I knew several good fellows who actually occupied well-paying technical jobs on state university staffs without ever finishing high school. I can cite you to campus buildings at some institutions of learning named after men who supervised courses and handed out diplomas and degrees without much more formal education themselves than the common school afforded. Yes, you've guessed it—those were agricultural schools and agricultural professors; and I feel we are just as well justified in admitting their careers as we might be if they had been wearers of cap and gown.

Under those looser rules of collegiate standing, the old world rolled on as usual. Work was accomplished up to a point with perhaps less confusion and vague uncertainty in the air we breathe than at present. I doubt if it has been proven that absence of higher learning or specialized training has really contributed overmuch to the tension and distraction and unrest. At least, it has seldom been shown that all our vast stores of newly accumulated knowledge and power—usually derived from specialization—are safe guarantees of peace or stability.

It's simply that to be highly trained and specialized these days is about as necessary as owning a car or a TV set, provided you wish to hold up your head, earn inflated-level incomes, dwell in ultramodernized homes, and get domestic and foreign assignments as advisers and technical specialists to boards, commissions, and governments.

However, one still finds traces of material success achieved by non-academic persons. In the corporation and promotion fields and the like, one still sees high-schoolers occupying big-name and high-bracket overseeing jobs. If one is highly aggressive, adaptable, and forceful, he can often make out without degrees. That is, there are places where strong plants will thrive and crowd out rivals, minus hothouse stimulation. But compared with former times, the path to power and renown usually leads one first through the laboratory and the campus. Quick short cuts are getting fewer.

FACING collegeward, most of our urban schools emphasize training for lifework, urging and prodding young minds to devote a larger portion of their formative years to constructive studies leading to degrees and personal development. A majority of today's total college population springs from city environment—although sometimes in a strict ratio of school youth to population a few of the rural villages and townships rank pretty high in this respect.

Even yet, most of the poorer schools are found in the open country. Does the quality of the resulting education

(*Turn to page* 42)

Red Apples Require Balanced Nutrition

By W. D. Weeks, F. W. Southwick, Mack Drake, and J. E. Steckel[1]

WHEN reaching for an apple do you pick the reddest one? When buying apples most housewives will select the reddest apples. Fruit growers of the Northeast are well aware of the sales appeal of the red fruit. However, many growers of McIntosh apples have difficulty in producing crops having a large proportion of highly colored apples. In years of large crops, poorly colored apples go begging, depress the general price level, or wind up in the cider mill. The production of a larger volume of highly colored apples is one of the major problems of McIntosh growers in the Northeast.

A recent study conducted by the Massachusetts Agricultural Experiment Station has shown that different fertility treatments produced a range of 28 to 79 per cent of fancy fruit in a commercial McIntosh orchard.

In the spring of 1949 a fertility experiment was initiated in a vigorous 16-year-old McIntosh apple orchard. Ten different annual treatments of 10 trees each were established. Three treatments consisted of ammonium nitrate applied at rates of 2, 4, and 6 pounds per tree. There were three hay mulch treatments which received 70, 140, and 210 pounds of hay per tree. The amount of hay for each mulch treatment was determined by the nitrogen content of the hay. Sufficient hay was used to give amounts of nitrogen equivalent to the 2-, 4-, and 6-pound ammonium nitrate treatments. One treatment was a combination of 2 pounds of ammonia nitrate per tree plus 70 pounds of hay. Nineteen pounds per tree of a 7-7-7 fertilizer were applied to one treatment while another received 19 pounds of 7-7-7 plus 2 pounds of ammonium nitrate. A final treatment of applying nitrogen in the form of a urea spray was used. The urea spray applied about one pound of actual nitrogen per tree. The hay and the fertilizer were applied annually as a band application under the drip of the branches of each tree in early April. The orchard has received applications of dolomitic limestone periodically to supply magnesium and calcium and to reduce the effect of sulfur spray materials on the soil.

Leaf samples were taken annually from each tree in late July for chemical analysis. Each year the nitrogen, phosphorus, potassium, calcium, and magnesium content of the foliage was determined for each tree in all of the different fertilizer treatments.

One of the most revealing results of the experiment was the effect of the different treatments on the chemical composition of the foliage. The potassium content of the leaves from the trees which received 4 and 6 pounds of ammonium nitrate was significantly lower than any of the other treatments. The average potassium content for the three seasons, 1949-1951, was 0.88 and 0.85 per cent respectively for the 4- and 6-pound treatments. This is well below the gen-

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erally accepted critical level of 1 per cent, and the foliage from these trees showed typical potassium deficiency symptoms. Leaves of the trees treated with hay mulch had the highest potassium content, 1.39 to 1.56 per cent. The potassium content of the trees treated with complete fertilizer was nearly as high as the hay mulch trees, 1.26 per cent, but when 2 pounds of ammonium nitrate were added to the complete fertilizer the potassium content dropped significantly (1.17 per cent potassium). When nitrogen was applied as urea spray, potassium was not depressed to the extent as when applied as ammonium nitrate (1.24 per cent potassium). Hay mulch resulted in a greater increase in phosphorus content of the leaves than the application of 7-7-7 fertilizer or other treatments.

The treatments which produced the highest leaf nitrogen were the 4- and 6-pound ammonium nitrate and the 7-7-7 fertilizer plus 2 pounds of ammonium nitrate. The hay mulch and the 2-pound ammonium nitrate trees had the lowest leaf nitrogen, while the urea sprayed trees were intermediate. The relationship of the nitrogen, phosphorus, potassium, calcium, and magnesium content of the foliage was interesting. With increasing leaf nitrogen, potassium and phosphorus decreased whereas magnesium and calcium increased. The amount of nitrogen which the trees received in the form of ammonium nitrate had a pronounced effect on the relative amounts of the other elements found in the foliage. This relationship of nitrogen to the quantities of other elements shows how a continuous fertilizer program of high rates of nitrogen without the other required mineral nutrients can seriously upset the nutritional balance in apple trees.

The effect of the fertilizer treatments was fully as revealing on fruit color as on chemical composition of the foliage.

Shortly before harvest in 1950, 1951, and 1952 a random sample of 50 fruits was taken from each tree to determine red color. Fruits which had 50 per cent or more red color were considered to be U. S. Fancy. The per cent of each tree's fruit grading U. S. Fancy was recorded and was compared to the fertility treatments. The effect of the

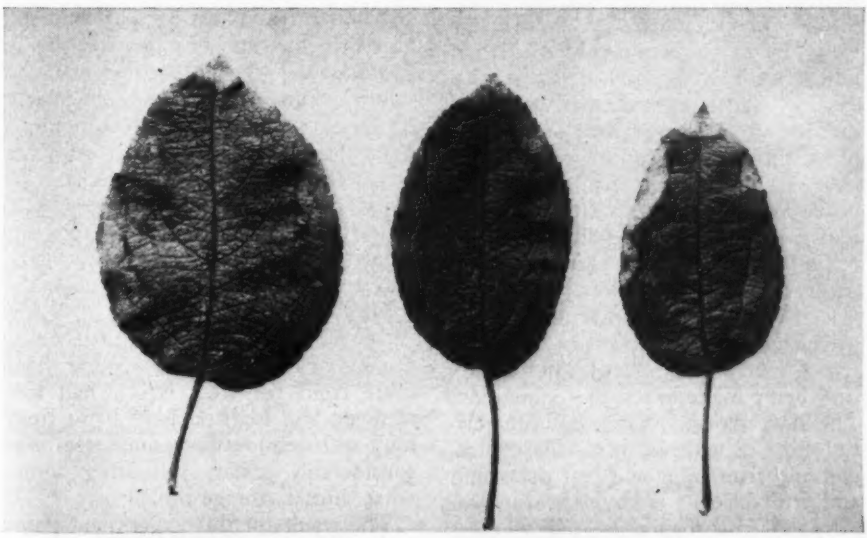

Fig. 1. Typical potassium deficiency symptoms of McIntosh apple leaves. Note the ashy gray burn on the margin of the leaf. High rates of nitrogenous fertilizers alone can produce similar symptoms on trees growing in Northeastern soils.

treatments on color and the relationship between leaf nitrogen and potassium and fruit are shown in Table I.

TABLE I.—EFFECT OF TREATMENT ON NITROGEN AND POTASSIUM RELATIONSHIP AND FRUIT COLOR.

Treatment	Per cent dry weight		Fruit color per cent fancy fruit
	N	K	
70 lbs. hay	1.88	1.45	71.3
140 lbs. hay	1.86	1.56	79.5
210 lbs. hay	1.99	1.39	71.1
70 lbs. hay + 2 lbs. NH_4NO_3	2.02	1.30	54.6
2 lbs. NH_4NO_3	1.96	1.15	64.5
4 lbs. NH_4NO_3	2.14	0.88	28.3
6 lbs. NH_4NO_3	2.20	0.85	30.2
19 lbs. 7–7–7	2.02	1.26	56.1
19 lbs. 7–7–7 + 2 lbs. NH_4NO_3	2.16	1.17	42.1
Urea spray	2.06	1.24	55.8

3-year average, 1949–51

It is interesting to note that the poorest colored fruit came from 4- and 6-pound ammonium nitrate treated trees and that these trees had the highest leaf nitrogen and lowest leaf potassium. The best colored fruit came from the hay mulch trees which had high potassium and low nitrogen. The complete fertilizer treatment was intermediate in fruit color, but when additional nitrogen was added to the complete fertilizer, both fruit color and potassium content of the leaf were reduced. It is possible that the fruit color for the complete fertilizer treatments would have been greater if sufficient potassium had been added to meet the demand created by the high rate of nitrogen applied. Studies are now being made to test this contention. The data showed that a definite relationship existed between leaf nitrogen and fruit color and leaf potassium and fruit color. With increasing leaf nitrogen, fruit color decreased; whereas with increasing leaf potassium, fruit color increased. The necessity of having the proper nitrogen-potassium relationship for the development of fruit color can best be shown by examining the data from the 4-pound ammonium nitrate treatment and the 7-7-7 plus 2 pounds ammonium nitrate treatment. The leaf nitrogen for these two treatments is almost identical, but the potassium is much higher for the 7-7-7 plus treatment. Fruit color was greater from the treatment with the higher leaf potassium indicating that potassium plays an important role in the development of fruit color. In April 1953 some of the treatments were changed. The color of the fruit from trees which received high rates of nitrogen and potassium was superior to fruit from trees which received high rates of nitrogen alone.

The authors recognize that fruit color is dependent upon more factors than tree nutrition but believe that nutrition plays an important role in determining the amount of fruit color which the tree is ultimately able to produce.

Yield records taken over the three-year period of the experiment indicated that the high nitrogen treatments produced somewhat more fruit than the low and medium nitrogen treatments. However, the high nitrogen treatments produced the smallest volume of fancy colored fruit. This was particularly true for the 4- and 6-pound ammonium nitrate treatments. These treatments produced only 6.3 and 5.5 bushels of fancy fruit for the 3-year average (1949-51) whereas the 210-pound hay treatment and the 7-7-7 treatment produced 11.5 and 9.1 bushels of fancy fruit.

In 1951 fruit firmness was determined at harvest. The firmest fruit came from the trees which had low nitrogen and high potash. Fruit from high nitrogen-low potassium trees was considerably softer, indicating somewhat shorter storage life.

The results of this experiment point out for growers of McIntosh apples

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Apply Fertilizers in Fall for Old Alfalfa, Grass Pasture, and Timothy-Brome Fields

By C. J. Chapman

Soils Department, University of Wisconsin, Madison, Wisconsin

OLD alfalfa fields which produced abundant crops of hay this past year have used up a lot of plant food. Why not "set the table" again this fall with a liberal topdressing of phosphate-potash fertilizer that will rejuvenate these fields and supply the plant food needed for next year's crop?

For best results in Wisconsin we recommend getting the fertilizer on by mid-September. We say apply mixtures such as 0-10-30 or 0-12-36 at rates from 300 to 500 lbs. per acre. Where there has been any evidence of a boron deficiency, topdress with 0-9-27B or 0-10-30B (B stands for boron which is supplied in sufficient quantities to meet the requirements of alfalfa grown on fields deficient in this element.) In fact the extra cost of the fertilizer

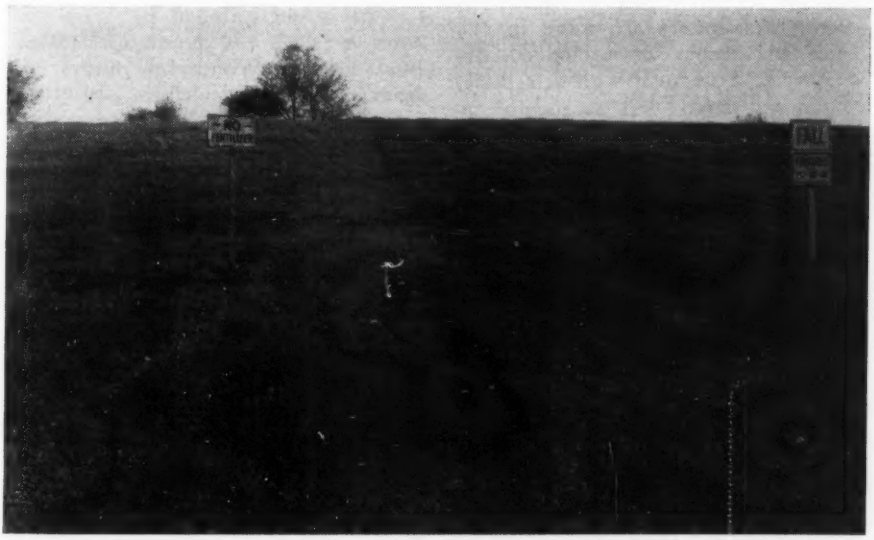

Fig. 1. This old alfalfa field on the Roy Schlough and Sons' farm, Mazomanie, Wisconsin, shows response to treatments with 0-20-20 applied as a topdressing in the fall of 1952. The picture was taken in June 1954. Winterkilling was bad on the unfertilized (left) and weeds took over.

Yields:	0-20-20 at 500 lbs./A	No fertilizer
1953 (2 cuttings)	3,300 lbs.	2,100 lbs.
1954 (1st cutting)	2,995 "	660 "
Totals	6,295 lbs.	2,760 lbs.

Fig. 2. Close-ups showing the relative growth of alfalfa from the treated and untreated portions of the field shown in Fig. 1.

to supply the element boron will amount to only $1.50 or so per acre and may be looked upon as insurance. (Boron deficiencies are more in evidence in seasons of prolonged dry weather.) Treatment with a fertilizer containing boron will frequently increase alfalfa seed production, even where there may not have been any apparent effect on the yields of hay. "Alfalfa yellows" due to leafhoppers working on the second crop is frequently mistaken for boron deficiency symptoms. Spraying alfalfa fields with an insecticide 10 days after the first cutting has been harvested is a positive preventive of "yellows" due to leafhopper damage.

Testing your soil for available phosphorus, potash, and boron will give a better idea of just what ratio of phosphorus and potash to use and will certainly be helpful in predetermining the need for boron. If your soil tests show a low phosphorus and as well, a low potash content, then it would be best to use a mixture such as 0-20-20. If deficient in boron, apply about 30 lbs. per acre of borax in addition to the 0-20-20.

10-10-10 for Pastures or Old Brome-Timothy Fields

What about nitrogen for grass pastures or these old brome-alfalfa timothy fields? Wonderful results can be expected next year where 10-10-10[1] or other high nitrogen fertilizer is applied on these pastures or old alfalfa hay fields that are running strong to brome or timothy. You can topdress late this fall or next spring. How much 10-10-10 per acre? We recommend 400 to 600 lbs. per acre. You'll frequently double and even treble the production on your June grass pastures next spring or make an extra ton of hay and at the same time build up the phosphate-potash content of your soil that will carry over to the following year. This residual carry-over of minerals will frequently stimulate the growth of the native clovers in these old grass pastures.

Yield data shown in Table I indicate that equally as good results can be obtained where 10-10-10 or 12-12-12 is applied in the fall as compared to

[1] Any 1-1-1 grade of fertilizer such as 8-8-8, 9-9-9, 12-12-12 or 13-13-13 may be substituted for 10-10-10.

TABLE I.—PASTURE TOPDRESSING RESULTS—FALL VS. SPRING—WISCONSIN

Name and address of cooperator and soil type	Treatment and how applied	Yield in pounds dry matter	Pounds increase
Hubert Kelter Black Earth Tama silt loam	500# 12–12–12 Fall application	2787	1947
	500# 12–12–12 Spring application	2404	1564
	No fertilizer	840	
Elmer Goke Belmont Tama silt loam	500# 12–12–12 Fall application	3016	1491
	500# 12–12–12 Spring application	3145	1620
	No fertilizer	1525	
Antone Adler Dane Carrington silt loam	500# 12–12–12 Fall application (1 clipping only)	5100	3225
	500# 12–12–12 Spring application (1 clipping only)	5625	3750
	No fertilizer	1875	

spring applications. On the Hubert Kelter farm the results were best from the fall-applied 12-12-12. In this case the grass got off to an earlier and more vigorous start in the spring. In fact it was ready for grazing several days ahead of the spring-treated portion. In the case of the Elmer Goke plots, the advantage for fall application was likewise very much in evidence in the early period of grazing. Later on, the spring-applied 12-12-12 caught up and carried its dark green color for a longer period. The response on the Antone Adler plots was a little in favor of the spring-treated area. Be that as it may, the thing we do want to emphasize is the fact that nitrogen fertilizer can be applied with good results in late fall on silt and clay loam soils in Wisconsin.

"Store It in the Soil"

Actually there is some advantage in applying fertilizer in the fall of the year —whether it be 0-9-27(B), 0-10-30, or 0-20-20 for alfalfa or late fall application of 10-10-10 or straight nitrogen for grass meadows. First of all you get the job done when there is firm footing for the tractor-truck or spreader, and this is especally important in connection with bulk spreading by truck. Many fertilizer manufacturers and their dealers give an extra price discount as incentive for fall purchases. Where applied in the fall the available plant food is there ready to feed the grasses and clover in these pastures or old hay fields when spring rains and sunshine wake them up from their winter's slumber.

Table II shows results from some of our fall-treated alfalfa fields. We really do show some outstanding responses to treatment in this yield data. Bear in mind the fact too that in most cases these increases in yield are for one or two cuttings only. If yield data had been secured, there most certainly would have been further increases and benefit from the fertilizer. Take a look at results of the George Hatfield and Roy Schlough & Sons topdressing plots. Their yields were taken both the first and second years following treatment. The residual carry-over benefit to the

TABLE II.—ALFALFA TOPDRESSING RESULTS—WISCONSIN

Name and address of cooperator and soil type	Treatment and how applied	Yield of hay in pounds	Pounds increase dry matter
Fred Pabst, Oconomowoc (1936) Waukesha loam	225# 0–20–20 T.F.* (1)	4000	1450
	225# 0–0–50 T.F. (1)	3590	1040
	No fertilizer (1)	2550	
R. John Clark, Janesville (1941) Silt loam	200# 0–20–20 T.S. (1)	4350	1500
	No fertilizer (1)	2850	
Albert Cox & Son, Beloit (1941) Sandy loam	200# 0–20–20 (1)	3748	1443
	No fertilizer (1)	2305	
Wilbert Reuter, Mazomanie (1950) Sandy loam	350# 0–9–27 T.F. (2)	5275	1450
	350# 0–9–27B T.F. (2)	5625	1800
	No fertilizer (2)	3825	
Knutson Bros. David Pabst, Oconomowoc (1950) Fine sandy loam	350# 0–9–27 T.S. (2) 150# Am. nitrate T.S. (2)	6500	2500
	150# Am. nitrate T.S. (2)	5500	1500
	700# 0–9–27 T.S. 1150# Am. nitrate T.S. (2)	6250	2250
	1050# 0–9–27 T.S. 150# Am. nitrate T.S. (2)	7500	3500
	No fertilizer (2)	4000	
Geo. Hatfield, Argyle (1950) (1951) Silt loam	400# 0–9–27 T.F. (2)	1949 = 5010 1950 = 5000 Total = 10010‡	4730
	400# 0–9–27B T.F. (2)	1949 = 5100 1950 = 5000 Total = 10100‡	4820
	No fertilizer (2)	1949 = 3180 1950 = 2100 Total = 5280	
L. W. Koelsch & Sons (1951) Hales Corners Clay loam	200# 0–9–27 T.S. (1)	6000	1950
	75# 0–9–27 T.S. (1)	4050	
Eugene Lillund, Conover (1952) Silt loam	500# 0–10–30 T.F. (2)	8438	2813
	No fertilizer (2)	5625	
Frank Schuster, Phelps (1952) Sandy loam	500# 0–10–30 T.F. (2)	7312	3187
	No fertilizer (2)	4125	

TABLE II.—ALFALFA TOPDRESSING RESULTS—WISCONSIN—*Continued*

Mike Rady, Woodruff (1952) Sandy loam	500# 0–10–30 T.F. (2)	9000	938
	No fertilizer (2)	8062	
Roy Schlough & Sons (1953) Mazomanie (1954) Sandy loam	400# 0–30–30 T.F. (3) 40# boron fert.†	1953 = 3300 1954 = 2995 Total = 6295†	3535
	No fertilizer (3)	1953 = 2100 1954 = 660 Total = 2760	
Joe Hodgson, Mazomanie (1953) Sandy loam	400# 0–20–20 T.F. (2) 40# boron fert.†	4800	1950
	40# boron fert.† (2)	2850	
	No fertilizer (2)	2850	

* T=Topdressed F=Fall S=Spring
‡ Combined yields for two years
† In form of sodium tetraborate pentahydrate

second year crop was much greater than that shown for the first year. In fact part of these increases the second year were due to a thinning-out or winter-killing of the alfalfa on the unfertilized plot.

Longevity of stand is an important and money-saving benefit. If we can maintain our stands in a high state of production for several years, we save on seed and land fitting costs. Figure 1, a picture of the Roy Schlough & Sons plots, shows in a striking way the outstanding 2nd-year residual carry-over benefit from the treatment applied the fall of 1952 on the crop of alfalfa in

Fig. 3. Here on the Hubert Kelter farm at Black Earth, Wisconsin, we see the response of pasture grasses to treatment with 12-12-12 applied October 26, 1953.

Yields in dry matter per acre: 12-12-12 (fall applied) 2,787 lbs.
No fertilizer 840 "

Fig. 4. This picture taken in early May shows the typical "last-minute run" on fertilizer factories. For days on end truckers were lined up blocks long waiting to be loaded, not only wasting their own time but overworking the factories. Fall purchase and application or early winter purchase and farm storage would greatly relieve this aggravating situation.

1954. Here we see a beautiful crop and a good stand as compared to the potash-starved and weed-infested unfertilized portion of the field.

Figure 2 gives us close-ups to show the differences in growth on the Schlough plots.

What About Nitrogen?

Straight nitrogen fertilizers can be applied in late fall to old grass pastures or timothy-brome fields on heavy soils in the Northern states, but give these fields a liberal application of 0-20-20 or 0-10-30 to back up this nitrogen. Confine application of 10-10-10 or straight nitrogen to the heavier silt or clay loam soils, and delay application until mid-October or until the temperature of the soil drops below 60°.

Anhydrous ammonia knifed into the cool, moist silt and clay loam soils in late fall stores perfectly under Wisconsin conditions, and it's cheaper storage than when held in the big expensive steel tanks. It can be cut or "knifed" into grass pastures, hay meadows, or stored in fall-plowed fields which are to be fitted for grain, corn, or other crops the following spring. Anhydrous ammonia is fixed chemically and held by the clay fraction. It's there all ready to feed your crop when these fields warm up in the spring. Your cost per unit of nitrogen will be less when you buy and apply in the fall. Remember storage is one of the problems of the anhydrous ammonia manufacturer. He is anxious to keep his plant in continuous production and will make some price concessions to those who will take part of his "off-season" output.

All fertilizers are bulky and require a rather steady flow of raw materials from the local fertilizer factory to the dealer's warehouse or tank storage. The manufacturer, and the dealer as well, must move the finished product onto the farm as quickly as possible. In turn, the farmer will, when feasible,

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Effect of Boron on Beets and Crops Which Follow

By Charles B. Sayre

Department of Vegetable Crops, New York Experiment Station, Geneva, New York

BORON is an essential element in plant growth. Most crops require such minute amounts of boron that they can obtain them from most agricultural soils. Beets require larger amounts of boron for healthy growth. On alkaline soils or in dry seasons, beets may not be able to obtain adequate boron unless it is added as a fertilizer. When beets do not obtain sufficient boron for healthy growth, an internal breakdown of the cells occurs, resulting in blackened dry areas in the beets which make them unacceptable for canning or market. This injury is commonly called *black spot* or *dry rot*. In severe cases large portions of the beet will turn black. In mild cases the trouble may not be observed until the beets are cut. For that reason an alert fieldman will cut into a few beets on the higher, dryer parts of a field to make sure the beets are not damaged by internal breakdown due to boron deficiency.

In alkaline soils, and particularly in soils on which lime has recently been applied, boron may be less available to crops because under alkaline conditions an insoluble compound of boron is formed. Consequently, beets growing on such soils are most likely to develop internal breakdown due to boron deficiency. For that reason, the addition of boron as a fertilizer for beets is recommended on alkaline soils or on soils recently limed.

Boron, Borax, and Borax Equivalents

These substances are closely related but are entirely different. The differences should be clearly understood when discussing the boron requirements of beets, and particularly when ordering fertilizers or determining the amount to be applied as a soil amendment.

Boron is a primary element and is one of the elements essential for plant growth. The important point to remember is that boron can become toxic to plants and will injure or kill plants if applied in concentrations not much higher than those most favorable for plant growth. Consequently, precautions must be taken to use the correct amount of boron fertilizers. Furthermore, crops differ in their boron requirements, and also in their tolerance to boron. Beets require relatively large amounts of boron, while beans are very sensitive to boron toxicity and may be injured or killed by the amount of boron fertilizer required by beets. Boron is not obtainable in elemental form. For fertilizer use it is supplied in the following compounds containing boron:

Borax ($Na_2B_4O_7 \cdot 10H_2O$) is the decahydrate of sodium borate. It is inexpensive, easily soluble, and supplies boron in a form readily available to plants. Borax contains 11.35 per cent of the element boron. It may be applied to the soil in finely powdered form mixed with other fertilizers, or it may be dissolved in water and sprayed on the soil or directly on the plants in dilute solution. Borax is the boron compound first used and recom-

mended by research workers [1] and [2] for controlling internal breakdown of beets. Because of the small amount required per acre (50 lbs. of borax on alkaline soils and 10 to 30 lbs. on acid soils) it is difficult to distribute it uniformly over a field. If not distributed uniformly, it might result in toxic concentrations in some portions of the field and inadequate amounts in other portions. Because commercial fertilizer mixers have facilities for accurately metering small quantities and uniformly mixing them in the complete bulk of fertilizer, it was recommended that the borax be mixed with the regular beet fertilizer. However, an unexpected difficulty developed when borax was mixed with the regular fertilizer. If not used within a few days the mixture would "set" in hard lumps and would have to be reground before it could be used in a fertilizer drill.

Other boron compounds were then tried, and the fertilizer companies soon discovered that the pentahydrate of sodium tetraborate could be mixed with regular commercial beet fertilizers and that this boron-enriched fertilizer could be stored indefinitely without caking, if kept in a dry place. The boron in ordinary borax (decahydrate of sodium tetraborate) and in the pentahydrate borate is readily available to plants.

Recommendations for applying the element boron as a plant nutrient were, and still are, given in terms of ordinary borax. However, the best boron compound to use in mixed fertilizers is the pentahydrate borate. Therefore, this is added in amounts equivalent to the amounts of borax recommended.

Borax equivalents: The pentahydrate of sodium tetraborate ($Na_2B_4O_7 \cdot 5H_2O$) contains 14.85 per cent of boron. It is the principal boron compound now used in fertilizers for beets or any other crop requiring extra boron. One company sells this boron compound under the trade name of "Fertilizer Borate." Another company sells a similar product under the trade name of "Agricultural Pentahydrate Borax." When a request is made for a mixed fertilizer containing a certain amount of borax per ton, the fertilizer mixer will add the equivalent amount of this boron compound (see Table).

The precaution to be observed in ordering a fertilizer containing boron is to state the amount desired in terms of pounds of borax per ton and not in terms of boron per ton. This is because borax contains only about 11.3 per cent of boron. If 50 pounds of borax are recommended per acre it means only 5.65 pounds of boron. In mixed fertilizer this would be supplied in the form of 41½ pounds of "fertilizer borate" or "agricultural pentahydrate borax." Bear in mind that 50 pounds of actual boron per acre would be toxic to practically all agricultural crops, and should never be used.

Another precaution to remember is that the recommendations are made on the basis of pounds of borax per acre. Therefore, the amount of borax equivalent to be added per ton of fertilizer would be determined by the rate of applying the fertilizer. For example, many growers apply 1,000 pounds of 5-10-10 fertilizer per acre for beets. If they wanted to apply 50 pounds of borax per acre they would need 100 pounds of borax per ton of fertilizer. To supply this the fertilizer manufacturer would add 83 pounds of high-grade borax equivalent per ton of fertilizer. Or if the grower were following the latest recommendations and using the equivalent amount of higher analysis fertilizer, he would apply only 625 pounds of 8-16-16 fertilizer per acre. This would require 160 pounds of borax, which would be supplied in 133 pounds of high-grade borax equivalent per ton of 8-16-16 fertilizer to supply the desired amount of boron per

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[1] Raleigh, Lorenz, and Sayre. "Studies on the control of internal breakdown of table beets by the use of boron." Cornell Agricultural Experiment Station Bul. 752, 1941.

[2] Walker, Jolivette, and McLean. "Internal black spot of canning beets and its control." Canning Age 19: 489-91. 1938.

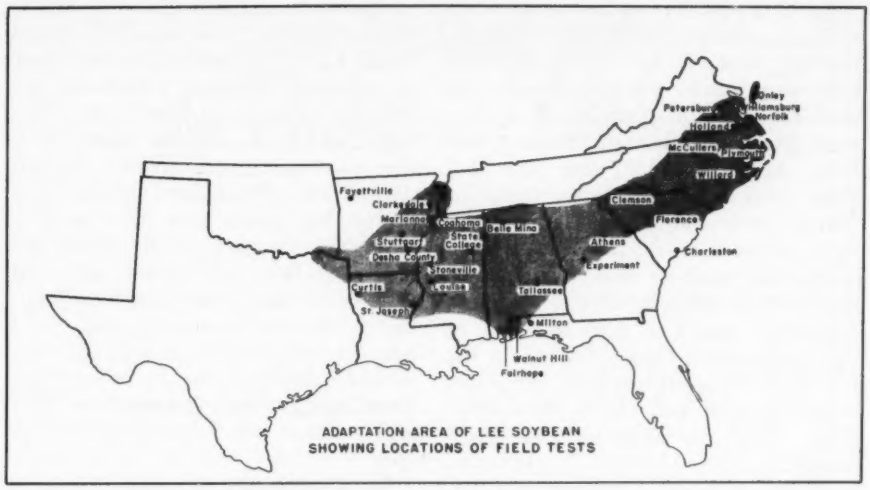

Fig. 1. Area of best adaptation of Lee soybeans.

Lee—A New Soybean for the Mid-South

By Edgar E. Hartwig[1]

Stoneville, Mississippi

A NEW, superior, non-shattering, disease-resistant soybean variety developed through cooperative research conducted by the U. S. Regional Soybean Laboratory and the agricultural experiment stations of the 12 Southeastern States has been named Lee. This variety is adapted to the same general area as Ogden and because of its superiority in seed holding, seed quality, and seed yield is expected to replace Ogden over much of the area where Ogden is now grown. While Ogden usually produces high yields over a wide area in the South, losses from shattering frequently occur, especially when the harvest period exceeds two weeks. Lee is the most shatter-resistant variety developed to date and is the first soybean variety developed in which disease resistance was a major objective. Lee averages five days later than Ogden, 21 days later than Dorman, and 10 to 12 days earlier than Roanoke or Jackson.

Seed stocks of Lee are being increased in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Arkansas. Growers interested in planting Lee for seed production in 1955 should contact their local County Agents or State Agricultural Experiment Station with regard to seed sources.

[1] Research Agronomist, Field Crops Branch, Agricultural Research Service, U.S.D.A., working in cooperation with the Delta Branch Experiment Station, Stoneville, Miss., and Coordinator of the U. S. Regional Soybean Laboratory Research program conducted in cooperation with the 12 Southern States.

Lee is a selection from a cross, S-100 x CNS, made in 1944 by Dr. Edgar E. Hartwig of the U. S. Regional Soybean Laboratory working in cooperation with the North Carolina Agricultural Experiment Station at Raleigh, North Carolina. An advanced F_3 line from this cross, N46-2566, was widely tested in North Carolina and appeared to be one of the better lines which combined good agronomic qualities with resistance to the bacterial pustule disease, a disease frequently found in soybean fields in the Southeastern United States. In the fall of 1948, approximately 100 plants were harvested individually from N46-2566. These new lines were evaluated jointly by Dr. Herbert W. Johnson, working in North Carolina, and Dr. Hartwig, at the Delta Branch of the Mississippi Agricultural Experiment Station. The variety now designated as Lee proved outstanding in performance in the North Carolina and Mississippi plantings and in 1951 was entered in the cooperative regional trials conducted by the U. S. Regional Soybean Laboratory in cooperation with research workers in the 12 Southeastern States. In these tests, planted at 35-40 locations each of the past three years in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas, Lee has continued to give outstanding performance. In comparison with Ogden, seed yield has been higher, seed coats have been sounder, oil content has been slightly higher, and seed have been held in the pods with little or no shattering. Lee is resistant to the diseases bacterial pustule, wildfire, frogeye, and purple seed stain and is more tolerant to root knot nematode than Ogden. Both varieties have moderate resistance to the leaf disease target spot.

Lee is generally adapted to the same areas of production as Ogden, except that it averages five days later in maturity, and, consequently, should not be grown as far north as Ogden is now grown. Lee is very similar to Ogden in that it has an average plant height of 30 to 36 inches, moderate size stems, heavy foliage, and purple flowers. The lowest pods are borne somewhat higher

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Fig. 2. Plants of Ogden, November 28, 1953, showing severe shattering.

Fig. 3. Plants of Lee, November 28, 1953, six weeks after maturity, showing no shattering.

Soil Testing and the Land-Grant Colleges

By D. A. Hinkle

Department of Agronomy, University of Arkansas, Fayetteville, Arkansas

THE old adage "nothing succeeds like success" certainly applies to soil testing. The success enjoyed by Land-Grant Colleges' soil testing services, most of which have been established since the end of World War II, has fired the enthusiasm of farmers more than any new development in a long time. There are some interesting problems connected with these services. It is the purpose of this paper to discuss a few of them.

Financing of a soil testing service becomes a real problem when the volume of samples tested becomes large. In April of 1952, Director Lippert Ellis of the Arkansas Agricultural Experiment Station made a survey of the Land-Grant Colleges for the purpose of obtaining information on (1) whether a soil testing service was maintained, (2) if one was provided, how it was financed, and (3) the approximate yearly number of samples tested. The results of this survey are summarized in Table I.

TABLE I—SUMMARY OF REPLIES FROM SURVEY

Information requested	States replying	
	Yes	No
Do you maintain a soil testing service for farmers?	44	4
Do you charge a fee for the service?	23	21
Do you receive a special appropriation for the service?	11	33
Do you receive the revenue from a special tax earmarked for the service?	1	43

The survey revealed that at the time of the survey all but four states maintained a soil testing service. Since then Alabama has established one. Twenty-three of the 44 states maintaining a service charged a fee.

The fee most often charged was $1.00, although the range varied from 35 cents to $6.50. Of the 11 states that received a special appropriation, four also charged a fee, indicating their appropriation did not provide enough money to offset costs. Of the 33 that did not receive a special appropriation, 14 also did not charge a fee, indicating that research funds were being used for the service. At the time of the survey only North Carolina received any revenue from a special tax, and it also received a special appropriation. The special tax is a tonnage tax on fertilizer sales, and some of the revenue thus raised is devoted to soil testing. Since 1953, Arkansas also has been receiving the revenue from a tax on fertilizer for soil testing purposes.

The total number of samples tested yearly by the 44 states was 1,222,700, or an average of 27,700 for each state. Assuming the average soil analysis costs a dollar to perform (cost figures have been kept at the Arkansas station for the last five years, and they average about this amount) it is evident that those states performing upwards of 20,000 to 50,000 analyses a year are

Fig. 1. In the Arkansas Soil Testing Laboratory Dr. R. L. Beacher, in charge, is shown operating the flame photometer.

putting considerable money into their soil testing program. Obviously the only fair way to pay for a soil testing service is to charge a fee, obtain a special appropriation, or obtain the revenue from a special tax. It hardly seems fair to use research funds for a service that is not research. Of course, it can be argued that the results of soil testing, when properly compiled, studied, and interpreted, become research. But the actual performing of the analyses and their interpretation in terms of a fertilizer recommendation for the farmer is a service just the same as a doctor's diagnosis of an illness with his prescription for its cure is a professional service.

Another problem of soil testing services is the orderly receipt of samples. The spring rush of samples to soil testing laboratories that occurs all over the country is ridiculous when one realizes that soil samples can be taken any time of the year, except when the soil is frozen or excessively wet or dry. An educational problem is involved, and it is closely related to the fertilizer industry's problem in obtaining an orderly movement of fertilizer throughout the year. We have noted a growth of state plant-food educational societies, particularly in the Southern States. One good project which these societies might well undertake in their respective states is an educational program leading to the more orderly taking of soil samples.

To operate a soil testing laboratory under spring rush conditions means one of two things. Either much larger facilities and staff must be maintained to service the rush period than will be needed the rest of the year, or the laboratory gets far behind during the rush period. Nothing will kill interest in soil testing quicker than for farmers to receive their fertilizer recommendations for spring-planted crops after the planting season. It is recognized that the spring peaks probably can never be eliminated, but it is believed they can be leveled off somewhat through an educational program.

The organization of a soil testing service may be a problem. In setting up a service, a decision that usually has to be made pertains to the alternatives of a central versus county laboratories. In a good many states a laboratory located at the Land-Grant College or University does all the testing for the

Fig. 2. This building was built to house the new Eastern Arkansas Branch Soil Testing and Research Laboratory. This will serve 26 counties in eastern Arkansas.

entire state. In a few cases, there is in addition to this main laboratory one or more branch laboratories located in important agricultural centers. In an increasing number of states nearly all counties have a laboratory in connection with the county agent's office. These laboratories, partly locally financed, perform a few rather simple colorimetric tests. Usually a technician is sent to the Land-Grant College for a short course of instructions in testing methods before he or she begins work at a given county laboratory. Likewise, county agents are brought to the college for courses of instruction on how to interpret the analyses in terms of fertilizer and soil management recommendations. Most generally, these short courses are given by agronomy or soils departments. Periodically, standard soil samples are sent to all county laboratories for analysis and reporting back of results in order to check the accuracy of the analyses.

A number of factors are involved in deciding which system will best serve the needs of a particular state. In general, a more extensive and accurate analysis can be made at the central laboratory because of the availability of more highly trained personnel and better laboratory equipment. It is not likely many county laboratories could afford one or more Ph.D soil scientists and expensive equipment such as flame photometer.

Another advantage of a central system is that one man can be in charge of making recommendations. He need not make all recommendations since to do so is obviously impossible where a large number of samples are processed each year. But at least he can be, and usually is, in charge of a relatively few assistants who help him make the recommendations. On the other hand, in the county laboratory system there are as many individuals in the state making fertilizer recommendations as there are county laboratories. One agent may be particularly well qualified while another may not. In fact, an agent may have little interest in it. The proponents of the county system claim that soil testing is brought closer to the farmer by the county laboratory and thus he obtains a more personalized service. There may be ample justification for such a claim.

Another distinct advantage of the

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Early and Delayed Grazing of Alfalfa, Orchardgrass, and Ladino Clover*

By R. H. Lush, A. G. Van Horn, and W. M. Whitaker

Tennessee Agricultural Experiment Station, Knoxville, Tennessee

A ROTATIONAL grazing experiment was started in 1949 to determine whether alfalfa might be maintained satisfactorily in a mixture with orchardgrass and ladino clover by rotational grazing under either all season or deferred grazing in Middle Tennessee. A field containing 19 acres was selected for this purpose. The soil was classified as Hermitage silt loam, Talbot silty clay loam, Emory silt loam, and Lindside silt loam. Soil tests indicated that phosphorus ranged from medium to very high, potassium was high, and the pH varied from 5.3 to 6.5.

The field was manured to help equalize fertility differences due to previous treatments, plowed, and limed at an average rate of 1.7 tons of ground limestone per acre. On August 17, 464 lbs. of 4-8-8 fertilizer and 25 lbs. borax per acre were applied. The field was seeded August 25 to a mixture containing 13 lbs. orchardgrass, 2 lbs. ladino clover, and 8 lbs. alfalfa. A thick stand resulted.

The field was divided into four replicate plots of equal area, and each plot was subdivided into three equal areas for rotational grazing. The grazing was carried on with producing Jersey cows. Except for the first time over, each subdivision was grazed 10 days followed by 20 days with no grazing. Two plots were grazed all season, April through October, when grazing was available. Grazing on the other two plots was delayed until after the removal of one cutting which was harvested either as hay or as silage. Cows were added to or removed from the plots depending upon the amount of grazing available. Close grazing was avoided. The grazing was supplemented by a home-mixed concentrate and with good quality alfalfa-orchardgrass hay.

During 1950 the plots grazed all season produced grazing at the rate of 218 standard cow days per acre. The milk yield was 8,909 lbs. (4% FCM) per acre with a farm value of $281.40 after deducting the value of the grain and hay fed to the cows. The two plots on which grazing was deferred produced 2,883 lbs. of hay and 147 standard cow days of grazing per acre. The milk yield per acre was 6,365 lbs. (4% FCM) with a farm value of $214.61 after deducting the value of the grain and hay fed to the cows. The value of the milk plus the value of the hay harvested amounted to $257.86, which was 8% less than the farm value of the milk from the plots grazed all season. But the yield of TDN from the grazing plus the hay cut was 9% greater than for the plots

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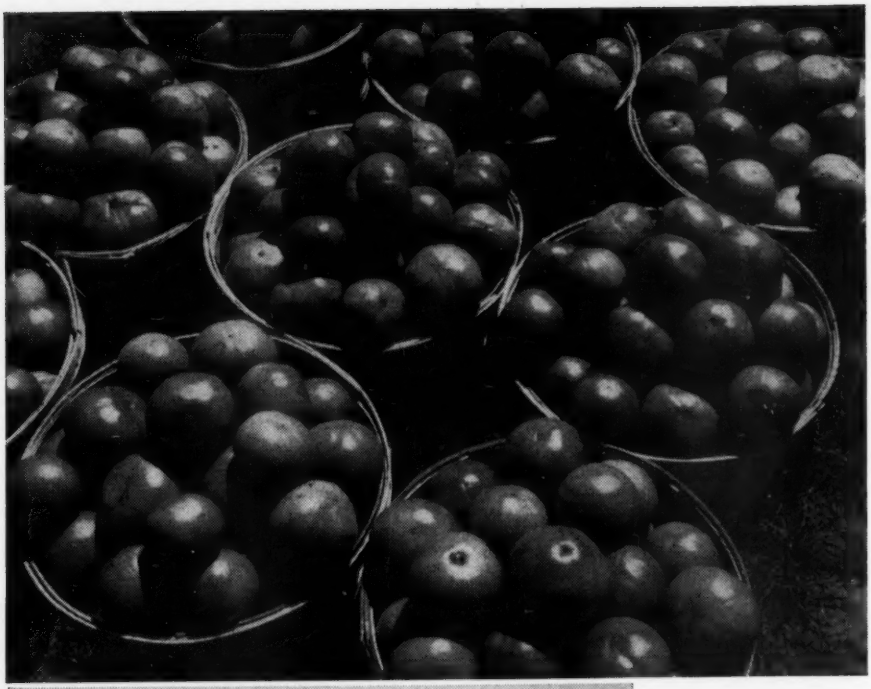
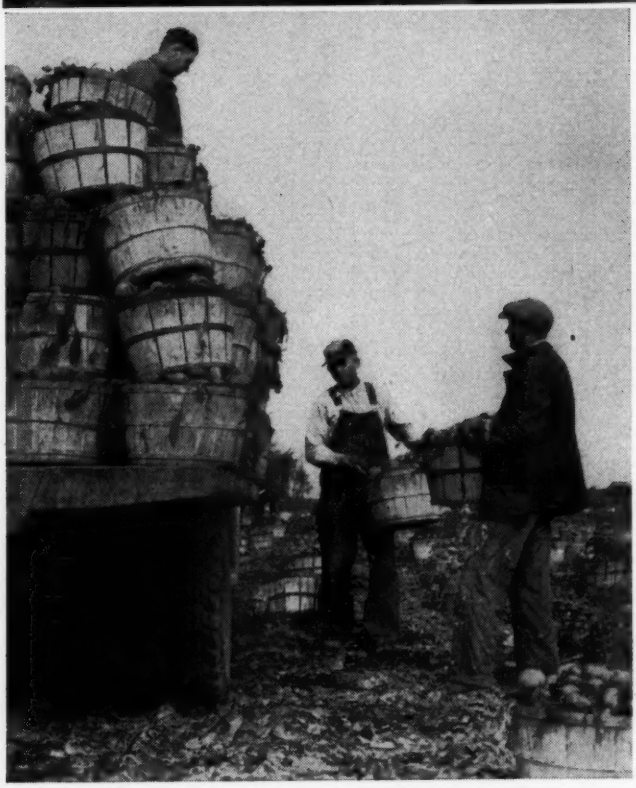
* Preliminary report, 1954. The experiment was conducted at the Dairy Experiment Station, Lewisburg, Tennessee, which is operated cooperatively by the Dairy Husbandry Research Branch, Agricultural Research Service, U.S.D.A., and the Agricultural Experiment Station, University of Tennessee.

PICTORIAL

Plenty Tough!





Quality Produce
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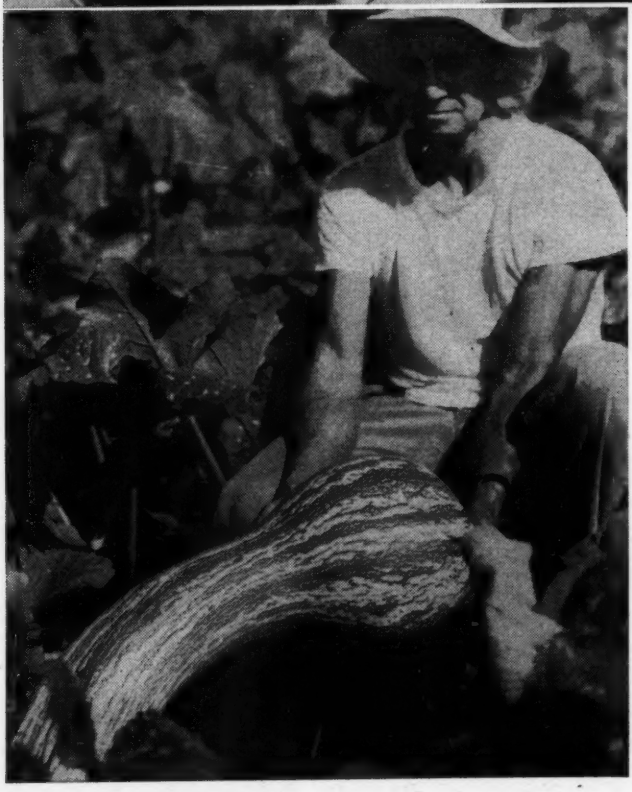

For Exhibit Only

The Editors Talk

Our Cover Picture

Like animals, fruit trees must be fed if they are to live. They must be fed properly if they are to be healthy; and certainly they must be healthy if they are to produce large yields of high quality fruit of high color, year in and year out. In the Eastern fruit region where the acreage is dominated by apples and peaches, soil management practices have not always been ideal, and there is still much room for improvement.

Our cover illustration features a well-managed block of McIntosh apple trees in the experimental orchards of the University of Massachusetts. The insert contrasts good versus poorly colored fruit as influenced by management practices. Details of the experiment are presented elsewhere in this issue in an article by W. D. Weeks, F. W. Southwick, Mack Drake, and J. E. Steckel.

According to them, McIntosh is the leading apple variety in the Northeast. It is a high producer and develops good color under favorable conditions of management, including fertilization. High production has usually been correlated with liberal use of nitrogen. As long as the nitrogen program was not overdone and the land had been in orchard for only one generation of trees, the nitrogen-only program was generally satisfactory. However, as growers began to increase nitrogen applications to increase yields and as their trees and orchard soils became older, it became more difficult to produce large crops of highly colored fruit of the type represented by insert on the cover page labeled "C". Too high a proportion of their crops were like the apples which appear in the cover picture under the label "G".

"The reason for the reduction in fruit quality at first appeared to be due entirely to the high rates of nitrogen because if the amount of nitrogen were reduced there was some improvement in fruit color. This is not surprising because at lower levels of nitrogen fertilization the tree's demand for other elements is reduced and it may be possible for the soil to supply sufficient amounts of potassium and other elements to meet the tree's needs. Failure to obtain a response from potassium applications in past orchard fertility studies is not difficult to understand if one considers that they were applied to trees of moderate nitrogen levels which did not have high potassium requirements and the soil still had an adequate supply of potassium to meet the tree's requirements. One could hardly expect to obtain a response from potassium if it was not a limiting factor.

"The old fertility experiments did not include chemical analysis of the foliage so it was not possible to know what the level of each element actually was. Leaf analysis data from recent orchard fertility experiments, however, have been most helpful in interpreting results and determining some sound fertilizer programs which will maintain large yields of high quality fruit. It has been shown that trees growing in soils low in potassium and high in nitrogen may have leaves showing typical potassium deficiency symptoms and poorly colored fruit. A check

of the leaf analyses of these trees reveals that nitrogen is out of balance with respect to potassium. The nitrogen content is too high and the potassium content is too low.

"By reducing the amount of nitrogen and adding potassium it is possible to bring about a better balance with respect to the nitrogen and potassium content of the leaves, thereby correcting the potassium deficiency and improving the fruit color. It is probably true that potassium will not improve fruit color when it is not a limiting factor, but under conditions of limited supply and unfavorable balance with nitrogen, potassium can play an important role in red color development.

"As we continue to exhaust the natural fertility of our orchard soils, we can expect the need for applying elements other than nitrogen to increase. A recent leaf analysis survey of 30 McIntosh orchards in Massachusetts showed the necessity for including elements other than nitrogen in the fertilizer program. The survey indicated magnesium to be the element most frequently in low supply. Potassium and calcium were low as frequently as nitrogen. Phosphorus was the only major element which appeared to be adequate in supply, but in time it too may become a factor in orchard fertilization. It is now a factor in the growth of adequate cover in our sod orchards.

"With improved techniques in determining the fertilizer requirements of our orchard soils, we can look forward to sounder fertilizer recommendations which will produce maximum yields of high quality fruit."

The Cost per Unit

Much emphasis has been placed upon a farmer's lowering his unit cost of production in order to maintain his profit margin in the face of declining farm prices. Countless evidence of fertilizer's role in achieving this end has been brought forth. As the item in his production costs that is not only relatively the cheapest but one which produces a very high rate of return per dollar invested, farmers have been urged to use fertilizer in full accord with the recommendations of their official agricultural advisers.

Results, while still leaving much to be desired, are gratifying. Nearly five times as much plant food was used by American farmers in 1953 as in 1935, and total tonnage of fertilizer was nearly quadrupled. In contrast, the average cost of plant food in the form of commercial fertilizer has gone up only about 12 per cent over the same span of years, whereas cost of all goods and services used in farm production has increased by 132 per cent since 1935.

The National Fertilizer Association in commenting on these figures points out that official reports of the U. S. Department of Agriculture show that the cost per ton of commercial fertilizer increased by 51 per cent from 1935 to 1953. In the same period, however, the average plant-food content of a ton of fertilizer also has been increased by nearly 35 per cent. Thus the increase in the average content of active ingredients has largely offset the higher cost.

Another reason for the relatively small increase in fertilizer prices when the prices of most other commodities were skyrocketing has been the tremendous expansion in the use of fertilizer, Dr. Russell Coleman, President of the National Fertilizer Association, explains. It has led to vastly improved efficiency in production and distribution. Advances in fertilizer technology have lowered manufacturing costs and made possible the production of better quality materials with improved physical properties which make storage and the job of spreading easier and less costly per unit of plant food to the farmer.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950.....	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951.....	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952.....	36.9	50.0	196.0	331.0	157.0	209.0	21.05	70.00	....
1953									
August.....	32.77	51.3	91.4	350.0	148.0	186.0	15.85	56.70	....
September...	33.09	57.6	98.9	264.0	150.0	192.0	16.15	51.50	....
October.....	32.46	52.6	89.7	233.0	134.0	194.0	16.45	52.40	....
November...	31.82	42.3	83.4	232.0	133.0	200.0	17.25	53.40	....
December....	30.73	49.2	69.9	246.0	141.0	201.0	18.25	53.00	....
1954									
January.....	30.05	48.3	69.1	253.0	142.0	203.0	19.05	52.00	....
February.....	30.42	31.9	65.3	258.0	143.0	206.0	18.95	51.40	....
March.....	31.05	27.3	53.2	252.0	144.0	209.0	18.35	50.50	....
April.....	31.57	....	70.2	268.0	145.0	206.0	18.05	50.80	....
May.....	32.17	58.0	134.0	263.0	147.0	200.0	17.05	51.40	....
June.....	32.31	53.0	151.0	270.0	149.0	191.0	15.65	51.40	....
July.....	32.18	52.7	149.0	302.0	150.0	200.0	15.15	54.00	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1928.....	145	200	76	134	131	113	95	152	147
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	128
1931.....	46	82	66	83	50	44	73	40	107
1932.....	52	105	55	62	50	43	52	46	100
1933.....	82	130	118	79	81	84	68	57	90
1934.....	100	213	64	91	127	96	111	146	94
1935.....	90	184	85	80	102	94	63	135	116
1936.....	100	236	164	106	163	116	94	148	108
1937.....	68	204	76	89	81	109	74	87	114
1938.....	69	196	80	79	76	64	57	97	96
1939.....	73	154	100	84	88	78	67	94	98
1940.....	80	160	78	97	96	77	64	96	122
1941.....	137	264	116	105	117	107	82	211	138
1942.....	153	369	168	134	143	124	91	202	178
1943.....	160	405	188	235	174	154	125	231	270
1944.....	167	420	214	216	170	160	139	234	236
1945.....	181	366	205	232	198	170	127	227	240
1946.....	263	382	178	248	212	209	141	319	217
1947.....	257	380	232	248	336	259	148	381	262
1948.....	245	482	222	253	201	226	155	298	253
1949.....	231	459	184	244	193	213	139	192	232
1950.....	323	517	132	197	238	226	141	384	211
1951.....	306	512	233	346	259	239	164	307	269
1952.....	298	500	281	377	245	236	177	310	274
1953									
August.....	264	513	131	399	231	210	134	251	221
September...	267	576	142	301	234	217	136	228	159
October.....	262	526	129	265	209	219	139	232	175
November...	257	423	120	264	207	226	145	237	186
December....	248	492	100	280	220	227	154	235	224
1954									
January.....	242	483	99	288	221	230	160	231	271
February.....	245	319	94	294	223	233	160	228	233
March.....	250	273	76	287	224	236	155	224	246
April.....	255	...	101	305	226	233	152	225	225
May.....	259	580	192	300	229	226	144	228	279
June.....	261	530	217	308	232	216	132	228	200
July.....	260	527	214	344	234	226	128	239	243

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [1]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [1]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [1]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953							
August	.895	....	....	.396	.768	14.72	.193
September	.895	....	....	.396	.768	14.72	.193
October	.895	....	....	.396	.768	14.72	.193
November	.895	....	....	.396	.768	14.72	.193
December	.895	....	....	.430	.827	16.00	.210
1954							
January	.895	....	....	.430	.827	16.00	.210
February	.895	....	....	.430	.827	16.00	.210
March	.895	....	....	.430	.827	16.00	.210
April	.895	....	....	.430	.827	16.00	.210
May	.895	....	....	.430	.827	16.00	.210
June	.895	....	....	.359	.710	13.45	.174
July	.895	....	....	.388	.765	14.75	.184
			Index Numbers (1910-14 = 100)				
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953							
August	167	...	...	71	81	61	82
September	167	...	...	71	81	61	82
October	167	...	...	71	81	61	82
November	167	...	...	71	81	61	82
December	167	...	...	76	87	66	85
1954							
January	167	...	...	76	87	66	85
February	167	...	...	76	87	66	85
March	157	...	...	76	87	66	85
April	167	...	...	76	87	66	85
May	167	...	...	76	87	66	85
June	167	...	...	66	75	56	79
July	167	...	...	70	80	61	81

Wholesale Prices of Ammoniates **

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	9.16
1953						
August	3.34	2.28	10.14	10.95	7.53	6.68
September	3.09	2.28	9.82	11.04	7.51	6.91
October	3.09	2.25	9.73	11.24	7.96	7.75
November	3.09	2.22	9.61	11.24	8.19	8.19
December	3.09	2.22	10.96	11.24	8.50	9.03
1954						
January	3.09	2.22	11.28	11.24	9.26	9.71
February	3.09	2.22	11.20	11.45	9.34	10.02
March	3.09	2.22	11.35	11.70	9.59	10.20
April	3.09	2.22	11.63	12.15	10.32	10.55
May	3.09	2.22	11.40	12.15	11.47	10.74
June	3.09	2.18	10.76	12.15	10.09	9.87
July	3.09	2.18	11.12	11.28	10.02	9.87
Index Numbers (1910-14 = 100)						
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	260
1953						
August	125	80	290	310	223	190
September	115	80	281	313	223	196
October	115	79	278	318	236	220
November	115	78	275	318	243	233
December	115	78	313	318	252	257
1954						
January	115	78	322	318	275	276
February	115	78	320	324	277	285
March	115	78	324	331	285	290
April	115	78	332	344	306	300
May	115	78	326	344	340	305
June	115	76	307	344	299	280
July	115	76	318	320	297	280

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1928.....	148	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	130	127	86	56	130	102	77
1942.....	159	149	144	93	57	161	112	77
1943.....	193	165	151	94	57	160	117	77
1944.....	197	174	152	96	57	174	120	76
1945.....	207	180	154	97	57	175	121	76
1946.....	236	197	177	107	62	240	125	75
1947.....	276	231	222	130	74	362	139	72
1948.....	287	250	241	134	89	314	143	70
1949.....	250	240	226	137	99	319	144	70
1950.....	258	246	232	132	89	314	142	72
1951.....	302	271	258	139	93	331	152	76
1952.....	288	273	251	144	98	333	158	76
1953								
August....	258	262	249	139	102	261	167	75
September.	256	259	249	137	97	258	167	75
October...	250	258	248	137	96	265	167	75
November.	249	259	247	137	96	267	167	75
December..	254	260	248	141	96	285	167	80
1954								
January...	259	263	250	142	96	300	167	80
February..	258	264	248	142	96	301	167	80
March....	256	264	250	143	96	307	167	80
April.....	257	265	250	145	96	323	167	80
May.....	258	267	250	147	96	338	167	80
June.....	248	265	248	141	95	311	167	69
July.....	247	263	248	142	95	310	167	74

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] Potash salts quoted F.O.B. mines; manure salts since June 1941; other carriers since June 1947. Beginning June 1954, muriate of potash quoted on both mine and port basis.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizers For Alaska, General Recommendations, 1954-1955," Agr. Ext. Serv., Univ. of Alaska, Palmer, Alaska, Cir. 513, Jan. 1954, W. M. Laughlin, H. J. Hodgson, C. H. Dearborn, and A. H. Mick.

"Effect of Boron on Cabbage and Cauliflower," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Prog. Rpt. 1, Jan. 1954, J. M. Lent and J. Scarchuk.

"Fertilizer Recommendations For Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Cir., 371, Rev. July 1954.

"Recommended Fertilizer Practices For Alfalfa," Agr. Exp. Sta., Univ. of Ga., Athens, Ga., Press Bul. 647, May 1954, J. M. Elrod.

"Nitrogen Recommendations," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., AG1588, Sept. 1953.

"Fertilizers, Fertilizer Materials And Rock Phosphate Sold in Illinois, July 1, 1953 to December 31, 1953," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AG1615, April 1954, S. W. Melsted and N. G. Pieper.

"Use of Anhydrous Ammonia as a Nitrogen Fertilizer," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., Cir. 519, Jan. 1954, P. E. Karraker and J. B. Kelley.

"Commercial Fertilizers, 1953," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Official Inspections 229, Oct. 1953, E. R. Tobey.

"Feed Your Crops," Agr. Ext. Serv., Miss. State College, Miss., Pub. 279, March 1954, I. E. Miles.

"1953 Report of Fertilizer Sales In Ohio," Agr. Ext. Serv., Ohio State Univ., Columbus, Ohio, May 26, 1954.

"Distribution Of Fertilizer In Oklahoma Counties By Grades And Material for the Period, Second Quarter, October 1, 1953 to January 1, 1954," State Dept. of Agr., Okla. City, Okla.

"Fertilizer Report For The Year 1953," Dept. of Agr., Harrisburg, Pa., Gen. Bul. 652, Jan.-Feb. 1954.

"Effects of Phosphate Fertilization on the Nutritive Value of Soybean Forage for Sheep and Rabbits," USDA, Wash., D. C., Tech. Bul. 1086, May 1954, G. Matrone, F. H. Smith, V. B. Weldon, W. W. Woodhouse, Jr., W. J. Peterson, and K. C. Beeson.

Soils

"Commercial Peat and Native Organic Materials in Connecticut," Agr. Exp. Sta., New Haven, Conn., Cir. 187, March 1954, H. G. M. Jacobson and C. L. W. Swanson.

"Brownstown Soil Experiment Field 1940-53, General Summary of Results," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AG1529a, 1954, F. C. Bauer and P. E. Johnson.

"Toledo Soil Experiment Field 1913—1953, General Summary of Results," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AG1529i, 1954, F. C. Bauer and P. E. Johnson.

"Soil Conservation Pays Off," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Bul. 575, April 1954, E. L. Sauer and H. C. M. Case.

"Soils of Daviess County, Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 604, July 1953.

"Soils of Custer County," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 489, Oct. 1953, L. F. Gieseker.

"Soils Survey, Jackson County, Alabama," USDA, Wash., D. C., Series 1941, No. 8, March 1954.

"Soils Survey, Collier County, Florida," USDA, Wash., D. C., Series 1942, No. 8, March 1954.

"Soil Survey, Baker Area, Oregon," USDA, Wash., D. C., Series 1941, No. 9, Jan. 1954.

Crops

"62nd and 63rd Annual Reports, Agricultural Experiment Station of the Alabama Polytechnic Institute, January 1, 1951—December 31, 1952," Agr. Exp. Sta., Alabama Polytechnic Institute, Auburn, Alabama, Jan. 1954.

"Results Of 1953 Cotton Variety Tests In Alabama," Agr. Exp. Sta., Alabama Polytechnic Institute, Auburn, Ala., H. B. Tisdale and A. L. Smith.

"Research and Alaskan Agriculture 1950-51," Agr. Exp. Sta., Univ. of Alaska, Palmer, Alaska, 15th & 16th Prog. Rpt., Oct. 1953.

"The Performance of Vetch and Winter Peas In Arkansas, 1950-1952," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 543, Jan. 1954, P. E. Smith.

"Your Next Move?" Agr. Ext. Serv., Univ. of Ark., Fayetteville, Ark., Lfl. 199, July 1953.

"Pasture Plans for Year-Round Grazing in the Ozark Uplands," Lfl. 200, Aug. 1953; "Pasture Plans for Year-Round Grazing in the Coastal Plains," Lfl. 201, Oct. 1953; "Pasture Plans for Year-Round Grazing in the Lower Ozark—Upper Ouachita Area," Lfl. 202, Oct. 1953; "Pasture Plans for Year-Round Grazing in the Delta and Terrace Area," Lfl. 203, Dec. 1953; Agr. Ext. Serv., Univ. of Ark., Fayetteville, Ark., W. H. Freyaldenhoven and W. R. Perkins.

"Peach Variety Tests," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Ser. 40, Feb. 1954, C. H. Hendershott, E. H. Arrington, and C. J. Westbrook.

"Dominion Experimental Station, Lacombe, Alberta, Progress Report—1947-1952," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., March 1954.

"Dominion Experimental Farm, Brandon, Manitoba, Progress Report, 1948-1952," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., March 1954.

"Experimental Station, Lethbridge, Alberta, Progress Report, 1947-1952," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., April 1954.

"Foliar Analysis Of Apple Trees, 1. Effect of Yield and Sampling Position," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Prog. Rpt. 3, March 1954, F. H. Emmert.

"Vegetable Crop Rotation Studies On Connecticut Soils," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Prog. Rpt. 4, March 1954, B. E. Janes.

"Annual Report For The Fiscal Year Ending June 30, 1953, Agricultural Experiment Stations," Univ. of Fla., Gainesville, Fla.

"1953 Report Florida Agricultural Extension Service," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla.

"Cantaloupe Production Guide," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Cir. 122, March 1954.

"Lettuce And Endive Production Guide," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Cir. 123, March 1954.

"Factors Affecting the Content of Ascorbic Acid In Tomatoes," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Bul. 573, April 1954, H. H. Hassan and J. P. McCollum.

"Progress of Agricultural Research in Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Sixty-Sixth Ann. Rpt.

"Small Grain Varieties—For Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette Ind., Sta. Cir. 400, Jan. 1954.

"1953 Iowa Corn Yield Test," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Bul. P116, Feb. 1954, J. L. Robinson and C. D. Hutchcroft.

"Kansas Corn Tests, 1953," Agr. Exp. Sta., Kansas State College, Manhattan, Kansas, Bul 364, Feb. 1954, A. L. Clapp and L. A. Tatum.

"Annual Winter Legumes," Dept. of Agr., Univ. of Ky., Lexington, Ky., Cir. 517, Dec. 1953, E. N. Fergus, L. Henson, and B. W. Fortenbery.

"Growing Tomatoes in Kentucky," Dept. of Agr., Univ. of Ky., Lexington, Ky., Cir. 518, Jan. 1954, J. E. Klinker.

"Experiments With Legumes at the Northeast Louisiana Experiment Station," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 477, C. B. Haddon.

"A Brief Discussion of the History of Sugar Cane," Dept. of Agr., La. State Univ., Baton Rouge, La., Thirteenth Edition, W. G. Taggart and E. C. Simon.

"Tuberous Rooted Begonias," Agr. Ext. Serv., Univ. of Mass., Amherst, Mass., Lfl. 260. Feb. 1954, A. W. Boicourt and R. E. Pride.

"Dahlias For the Home Garden," Univ. of Mass., Amherst, Mass., Lfl. 261, Feb. 1954, R. E. Pride.

"Ninety-Second Annual Report of the Secretary of the Michigan State Board of Agriculture 1953, and Sixty-sixth Annual Report, Agricultural Experiment Station, July 1, 1952 to June 30, 1953," Brd. of Agr., East Lansing, Mich., Mich. State College Pub., Vol. 48, No. 12, June 1954.

"Grass Silage," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Ext. Fldr. 181, May 1954, R. Briggs and H. Searles.

"Missouri Hybrid Corn Yield Tests for 1953," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 613, Jan. 1954, M. S. Zuber and B. H. Beard.

"Irrigated Pasture Investigations Huntley Branch Station, Huntley, Montana," Agr. Exp. Sta., Mont. State College, Bozeman, Mont. Bul. 496, Jan. 1954, D. V. Kopland, A. H. Post, and R. E. Stitt.

"Seventy-Second Annual Report, 1953, New York Agricultural Experiment Station, Geneva, N. Y.," New York State Agr. Exp. Sta., Cornell Univ., Geneva, N. Y., July 1953.

"Christmas Tree Farming," College of Agr., Cornell Univ., Ithaca, N. Y., Bul. 704, Rev. March 1954, J. A. Cope and F. E. Winch, Jr.

"Asparagus," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 909, March 1954, C. B. Raymond.

"Measured Crop Performance Small Grain 1953," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Res. Rpt. 4, Aug. 1953, M. G. McKenzie and W. H. Rankin.

"Measured Crop Performance, Corn, 1953," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Res. Rpt. 6, Dec. 1953, W. H. Rankin and M. G. McKenzie.

"Measured Crop Performance, Cotton, 1953," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Res. Rpt. 7, Dec. 1953, W. H. Rankin and M. G. McKenzie.

"Variations In the Hicks Variety Of Bright Tobacco," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Res. Rpt. 9, Dec. 1953, T. J. Mann and G. L. Jones.

"A Tracer Technique To Measure Growth

and Activity of Plant Root Systems," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Tech. Bul. 101, Oct. 1953.

"Crops And Soils," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Fifth Annual Edition, 1954.

"Agricultural Progress Through Research, Annual Report—1952-1953," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 387, Jan. 1954.

"Cabbage . . . factors affecting vitamin values and palatability," Agr. Exp. Sta., Wooster, Ohio, Res. Bul. 742, April 1954, M. B. Patton and M. E. Green.

"Turf Grasses, Their Development and Maintenance in Oklahoma," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-425, June 1954, W. C. Elder.

"Potato Cultural Practices In Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 430, April 1954, E. C. Pifer.

"Vegetable Variety Trials—1953," Agr. Exp. Sta., State College, Pa., Prog. Rpt. 114, March 1954, M. L. Odland and C. J. Noll.

"South Dakota Corn Performance Tests 1953," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 101, Feb. 1954, D. E. Kratochvil and D. B. Shank.

"Pasture Management For Dairy Cattle," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. 234, March 1954, R. H. Lush.

"Hybrid Corn Tests In Utah," Agr. Exp. Sta., Utah State Agr. College, Logan, Utah, Bul. 367, Feb. 1954, R. W. Woodward and R. F. Nielson.

"Cotton Defoliation Tests In Texas, 1953," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1680, May 6, 1954.

"Castorbean Production And Variety Testing In Texas, 1953," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1684, May 13, 1954, D. D. Poole.

"Cotton Variety Tests At Beeville, 1951-53," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1686, May 31, 1954, L. Reyes and R. A. Hall.

"Agricultural Research Report of the Virginia Agricultural Experiment Station, July 1, 1950-June 30, 1953," Agr. Exp. Sta., Va. Polytechnic Institute, Blacksburg, Va., Dec. 1953.

"Experiments With Field Crops, Soils, and Fertilizers," Agr. Exp. Sta., Va. Polytechnic Institute, Blacksburg, Va., May 1954.

"Sweet Sudan Grass for Summer Pasture," Agr. Ext. Serv., Va. Polytechnic Institute, Blacksburg, Va., Lfl. 1, May 1954.

"Grow—Can—Serve Tomatoes," Agr. Ext. Serv., Va. Polytechnic Institute, Blacksburg, Va., Cir. 542, Rev. June 1954.

"What's New in Farm Science," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 510, Jan. 1954.

"Hiland—A Better Barley," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Bul. 330, March 1954, R. P. Pfeifer.

"Mint Farming," USDA, Wash., D. C., Farmers' Bul. 1988, Feb. 1954.

"Growing Peanuts," USDA, Wash., D. C., Farmers' Bul. 2063, May 1954, J. H. Beattie, F. W. Poos, and B. B. Higgins.

"Varieties of Hard Red Winter Wheat in the United States," USDA, Wash., D. C., Cir. 938, April 1954, L. P. Reitz and C. O. Johnston.

Economics

"Alabama Agricultural Statistics," USDA, Wash., D. C., Bul. 4, June 1953.

"Irrigated Pastures, Costs Of Production," Agr. Ext. Serv., Univ. of Calif., Hayward, Calif., Co. Cir. 29, April 1953.

"Diverted Acres—Their Use and Conservation," Agr. Ext. Serv., Univ. of Del., Newark, Del., Fldr. 36, March 1954.

"Some Trends and Characteristics of the Dairy Industry in Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 539, March 1954, W. K. McPherson and R. F. Luckey, Jr.

"Economics of Some Soil Conservation Practices," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 403, Dec. 1953.

"What's the Outlook? for Kentucky Agriculture In 1954," College of Agr., Univ. of Ky., Lexington, Ky., Lfl. 141, Jan. 1954.

"What About the Burley Tobacco Control Program?" College of Agr., Univ. of Ky., Lexington, Ky., Cir. 516, Dec. 1953, G. L. Johnson and H. M. Young, Jr.

"Louisiana Farm Products Quantity Sold, Prices, Cash Income from Sales, and Purchasing Power, 1909-1952," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 480, June 1953, J. P. Montgomery.

"An Economic Analysis of The Impact of Government Programs on the Potato Industry of the United States," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Tech. Bul. 211, June 1954, R. W. Gray, V. L. Sorenson, and W. W. Cochrane.

"Cotton Marketing in the Upland Area of Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 517, May 1954, C. M. Wells, Jr. and J. M. Beaird.

"North Carolina Agricultural Statistics," Dept. of Agr., Raleigh, N. C., No. 95, March 1954.

"A Social and Economic Study of Two Resettlement Communities in Puerto Rico," Agr. Exp. Sta., Univ. of Puerto Rico, Rio Piedras, Puerto Rico, Bul. 114, Aug. 1953, J. M. Rios and P. B. V. Calcerrada.

"Estimated Costs And Returns From Major Farm Enterprises, Tennessee, 1952," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Mono. 268, Feb. 1954.

"The Farmer Looks at His Economic Security," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Bul. 774, Jan. 1954, W. G. Adkins and J. R. Motheral.

Red Apples Require Balanced Nutrition

(*From page* 8)

some important factors which can improve color and storage life.

The potassium requirements of the tree should be met by applying adequate quantities of potassium fertilizers or hay mulch. As growers raise the level of potassium applications they should adopt a high magnesium liming program to prevent the occurrence of potassium-induced magnesium deficiency.

The practice of using only nitrogen-carrying fertilizers will eventually lead to an unbalance in the tree's nutrition and the production of poorly colored, low quality fruit. Careful consideration should be given to the amount of nitrogen applied to McIntosh orchards so as to prevent an unfavorable balance with potassium.

Hay mulch is highly valuable because of the balance of nutrients contained in the hay and because of the beneficial effects of organic decomposition products of the hay on availability of phosphorus.

Effect of Boron on Beets . . .

(*From page* 16)

acre.

The amount of borax that should be applied per acre for beets will depend on the alkalinity of the soil. On alkaline soils (pH above 7) 50 pounds of borax per acre are recommended. This amount should also be applied to acid soils that have been limed to correct the soil acidity. On slightly acid soils (pH 6. to 6.5) the equivalent of 10 to 30 pounds of borax respectively is recommended per acre. On more acid soils, boron is likely to be available in sufficient amounts, and not over 10 pounds of borax are recommended per acre, unless lime is first applied. Lime is recommended on such soils for beets.

The accompanying Table shows the amount of borax equivalent that should be added to the two grades of fertilizer most commonly used for beets to apply the amounts of these fertilizers and borax recommended per acre in relation to the acidity of the soil.

Crops Following Beets

If beets fertilized with boron have

RELATION OF SOIL ACIDITY TO AMOUNT OF BORAX AND BORAX EQUIVALENT FOR BEET FERTILIZERS

Soil Acidity	Recommended rates per acre		
	Lbs. of borax per acre	1000 lbs. of 5–10–10	625 lbs. of 8–16–16
		Lbs. of borax equivalent* per ton	
pH 7.+	50	83	133
pH 6.5	30	50	80
pH 6.0	10	17	27

* Equivalent amount of boron supplied in the form of "fertilizer borate" or of "agricultural pentahydrate borax."

been grown on the same field for two or more years in succession, precautions should be taken in choosing the crop to succeed beets on that land, because there is a possibility of a build-up of the boron content of the soil to the point where it might be toxic to boron-sensitive crops such as beans. On the other hand, there are many crops in addition to beets that often develop boron deficiencies and that are benefited by the addition of small amounts of boron per acre on alkaline or near-alkaline soils. Such crops with relatively high boron requirements are cabbage, broccoli, cauliflower, turnips, rutabagas, celery, and alfalfa. Any of these crops would be desirable crops to follow beets in a rotation, especially where beets have been grown and fertilized with borax two or more years in succession.

There are other crops that are very sensitive to boron toxicity. Beans are particularly susceptible to boron injury and would be a hazardous crop to plant on land that had received boron fertilizer the preceding two or more years in succession. However, beans may be planted safely after a single year of boron-fertilized beets.

Soil Testing and the Land-Grant Colleges

(*From page* 21)

central laboratory system results when the analyses of a large number of samples are compiled and studied. Such studies are greatly facilitated by punching on business cards the results of soil tests, along with other pertinent information about the samples. Such procedures permit making summaries and correlations of soil test data from hundreds of thousands of samples in a relatively short time. Soil test summaries are valuable aids to educational programs of the Extension Service as well as a basis for better and improved recommendations. It is apparent that a central system where testing methods are uniform, where the testing is all done by the same personnel, and the recommendations are the responsibility of one person, naturally lends itself to this type of study much better than the county system.

A state soil testing service should always be operated by some division of the Land-Grant College or University. It may be the Experiment Station, the Extension Service, or both. The dependence of soil testing upon research is what makes the association with the Land-Grant College system a necessity. As far as is known to the writer all state services are at present operated by the Land-Grant College or by an agency closely associated with it.

Apply Fertilizers in Fall . . .

(*From page* 14)

find the cheapest and safest storage in the soil.

In order to get the ideas and opinions of agronomists in other states pertaining to fall and spring application, a questionnaire was sent out to some 25 leading agronomists in the Northern states. These men were ten to one in favor of late fall application of nitrogen fertilizer. Many of them supplied yield data based on carefully conducted experiments which proved without question that nitrogen fertilizer could and can be applied in the fall

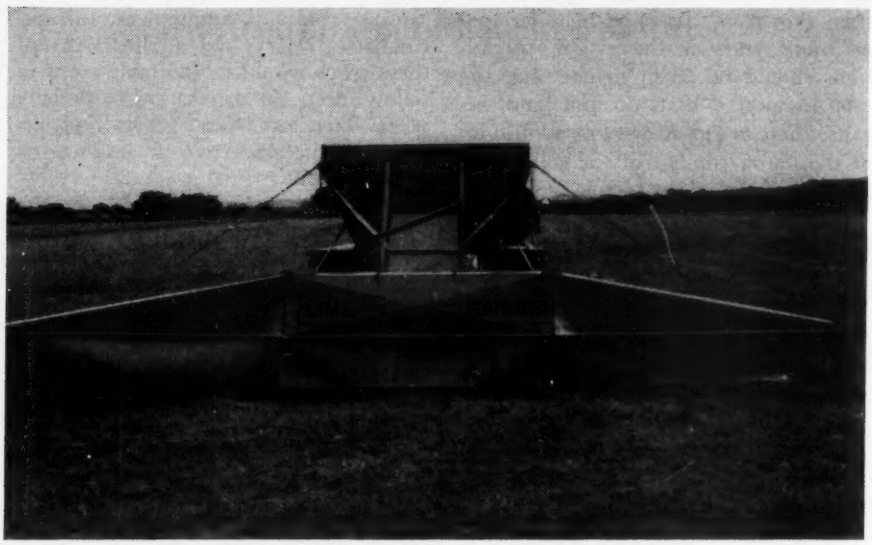

Fig. 5. Topdressing an old alfalfa field with 0-9-27B (mid-July). Bulk spreading of fertilizer by the local dealer or custom operator gets the job done for the farmer at low cost and, as in this case, during the busy summer season when the farmer doesn't have time to do the job himself. The anhydrous ammonia custom applicator men are finding this bulk spreading of fertilizer a good "off-season" adjunct to their business, not only profitable to themselves but, by supplying minerals, making nitrogen more effective.

with just as good results as when applied in the spring.

And so I say let's stop quibbling over some minor differences of opinion and inconsequential factors "for" or "against" and encourage farmers to get the job done. Let's encourage our farmers to carry out practices that make money for them and redound to their ultimate good. Let's help the fertilizer manufacturer to operate his plant at maximum efficiency, on a 12-month rather than a seasonal basis.

Yes! and there wouldn't be that "last-minute run" on the fertilizer factory if more farmers in the Northern states would buy and apply more of their fertilizer in the fall. "Store it in the Soil" is a good slogan, and what we don't "Store in the Soil" we can profitably store in the barn or granary and hold till planting season rolls around in the spring.

Seed Around Farm Ponds

BARE soil around your farm pond should be seeded with grass to protect the slopes from erosion and to keep the pond from filling with silt.

B. A. Jones, University of Illinois Agricultural Engineer, points out that dry weather last fall caused seeding failures at many newly constructed farm ponds. And in some cases farmers felt that it was too dry to even seed.

Jones offers these suggestions for getting a good stand of grass on the earth dam and on the area around your farm pond:

Prepare a good seedbed. Apply 8-8-8 or 10-10-10 fertilizer at a rate of 400-800 pounds per acre. A 50-50 mixture of timothy and redtop at 24-30 pounds per acre is recommended for most of Illinois. But brome grass, tall fescue, or perennial rye grass also may be used.

Lee—A New Soybean . . .

(*From page* 18)

TABLE I.—COMPARISON OF THE PERFORMANCE OF LEE AND OGDEN SOYBEAN VARIETIES IN REGIONAL TESTS, 1951-53

	Seed yield	Maturity	Height	Seeds per pound	Seed holding	% Protein	% Oil
Lee	29.3	10–15	30	3,400	Excellent	40.7	21.5
Ogden	27.5	10–10	31	3,000	Fair	40.8	21.3

off the ground than with Ogden, which will reduce combine losses. Lee differs from Ogden in that the hairs on the pods and stems are brown, whereas on Ogden they are gray. The seeds are glossy yellow with a black hilum, or eye, in contrast to the olive green seed with a brownish-black hilum of Ogden.

Over the three years during which Lee has been compared with Ogden in over 90 different tests in the Southeastern States, its seed yield has averaged 29.3 bushels per acre in comparison with 27.5 bushels for Ogden. Oil content of Lee has averaged 21.5 per cent compared with 21.3 per cent for Ogden.

Because of its seed-holding qualities and resistance to the major soybean diseases, Lee should help stabilize soybean yields in the areas where it is adapted.

Lee is the third in a series of new, superior soybean varieties adapted for production in the Southern States. Dorman, announced in 1951, is 21 days earlier than Lee; and Jackson, announced in 1952, is 12 days later than Lee. Fitting Lee into a production program with either or both of these varieties will permit a larger acreage to be harvested per combine, which should help reduce production costs.

Fig. 4. A Lee increase field in the Delta area of Mississippi, 1953.

Early and Delayed Grazing . . .

(*From page* 22)

grazed all season. The rainfall during the summer grazing season of 1950 was about two inches below normal but the distribution was better than is normally expected.

During 1951 the plots grazed all season produced only 108 standard cow days of grazing per acre as rainfall was eight inches below normal. The milk yield was 4,617 lbs. per acre with a farm value of $158.55 after deducting the value of the hay and grain fed to the cows. The plots on which grazing was delayed produced 2,652 lbs. of hay and 51 standard cow days of grazing per acre. The milk yield per acre was 2,722 lbs. with a farm value of $104.17. The value of the milk plus the value of the hay amounted to $143.95, or 9% less than the value of the milk from the plots grazed all season. The TDN supplied by the hay plus grazing was 24% more than was supplied by the plots grazed all season. No grazing was available August 10-October 3 due to dry weather.

The summer of 1952 was another very unfavorable season for grazing. The total summer rainfall was seven inches below normal and there was practically no effective rainfall during the months of May, June, and July. Grazing on the all-season plots was started April 14 and continued through October 31 except for 15 days, August 1 to 15, when grazing was not available. But 104 standard cow days and 4,458 lbs. of milk were obtained with a farm value of $185.28 per acre after deducting the value of grain and hay fed. The other plots produced 6,921 lbs. of grass silage per acre with grazing starting June 6, giving 74 standard cow days and 3,523 lbs. of milk per acre. The value per acre was $186.83 after deducting feed fed and crediting the silage produced. The calculated yield of TDN supplied was 55% more than obtained from the all-season plots.

Again 1953 was a season of variable rainfall with 5.4 inches less than normal. The all-season plots gave 117 standard cow days and 5,560 lbs. of milk with a net value of $205.62 per acre to September 8 when all cows were taken off the plots. A yield of 12,763 lbs. of silage, 64 cow days, and 3,322 lbs. of milk per acre was obtained from the delayed-grazing plots. The value per acre was $152.27 after deducting feed and crediting the yield of silage. The calculated yields of TDN were 92% greater for the delayed grazing, however.

During the four seasons (1950-53) the plots grazed all season produced an average of 137 standard cow days and 5,886 lbs. milk per acre and the plots on which grazing was delayed, a cutting of 3,024 lbs. of hay or 9,073 lbs. silage plus 84 standard cow days and 3,983 lbs. milk per acre. The average value above feed costs for all-season grazing was $207.71 per acre; for the delayed grazing plus hay or silage harvested, an average of $183.72 per acre, a net value of $23.99 or 13% in favor of all-season grazing. But the plots on which grazing was delayed produced an average yield of 3,025 lbs. of calculated TDN per acre and the plots grazed all season, an average yield of 2,188 lbs. calculated TDN per acre. The difference in yield of TDN amounted to 38% in favor of the delayed grazing and was progressively greater each of the four years.

There have been no fertility additions since the pasture was seeded except the application of 200 lbs. per acre of 60% muriate of potash plus borax in February 1952 and again in 1953. This

TABLE I.—YIELDS FROM ROTATIONAL GRAZING OF ALFALFA-ORCHARDGRASS, AVERAGE 1950-53, PER ACRE

	Grazed All Season			One Cutting + Grazing			
Year	Cow days	Milk 4%, lbs.	Value over feed	Silage, lbs.	Cow days	Milk 4%, lbs.	Value over feed
1950.....	218	8,909	$281.40	8,649	147	6,365	$257.86
1951.....	108	4,617	$158.55	7,956	51	2,722	$143.93
1952.....	104	4,458	$185.28	6,921	74	3,523	$180.83
1953.....	117	5,560	$205.62	12,763	64	3,322	$152.27
Av. 4 years....	137	5,886	$207.71	9,072	84	3,983	$183.72

with an initial lime, fertilizer, and seeding cost of $34.69 gives an average of less than $15.00 per acre maintenance cost.

At the end of four years, the stand of alfalfa in the plots where grazing was deferred does not appear to have weakened much and is better than in the plots grazed all season. The ladino clover thickened up on all plots during the favorable grazing season of 1950 but almost disappeared from all plots during the extreme drouth conditions of 1951. The orchardgrass did not tiller as much in the plots where the deferred grazing was conducted as in the plots grazed all season. Some orchardgrass died in all plots during the extremely drouthy weather but the stand of orchardgrass remaining after four years is better in the plots grazed all season than in the plots where grazing was deferred.

Chemical analysis of vegetation from all plots obtained in June showed an average of 24.65% crude protein, 8.25% lignin, and 10.07% total ash on a dry matter basis. Samples obtained in October gave an average of 25.66% crude protein, 8.37% lignin, and 10.60% ash. There was little variation between samples but rather high protein and low lignin. The cows obtained an average of 62% of their total TDN requirements from grazing during the four years, with a variation of 58 to 65%.

The distribution of the grazing obtained varied with the distribution of the rainfall received. During the very favorable season of 1950 when the rainfall was only two inches below normal and well distributed, 26% of the total grazing from the plots grazed all season was obtained during April and May. During 1951 when the rainfall was eight inches below normal and poorly distributed, 58% of the grazing from these plots was obtained during April and May. Again in 1952 with rainfall seven inches below normal and poorly distributed, 45% of the grazing was obtained during April and May. These variations suggest the advisability, from a practical farm viewpoint, of having an acreage considerably in excess of the requirement for grazing during the early part of the season, which may be harvested either as hay or preferably as silage, in order to have sufficient pasture later in the season, and to furnish stored feed for later feeding in dry periods or in winter.

The rainfall received during the four years of this experiment averaged 5.8 inches below normal for April through October. The yield of grazing obtained from the plots grazed all season was favorable when compared to the yield previously obtained from bluegrass-white clover pasture on a portion of the same land over a 4-year period when the rainfall averaged only two inches below normal. This mixture of orchardgrass, ladino clover, and alfalfa averaged 143 standard cow days per acre as compared to 90 standard cow days for the bluegrass-white clover mix-

ture, a difference of 59%.

Conclusions

Results to date indicate that (1) ladino clover will not survive in a mixture with orchardgrass and alfalfa in summers as drouthy as 1951-53, (2) orchardgrass and alfalfa stands can be satisfactorily maintained and yields will be comparatively high for at least four years by both all season and deferred grazing when rotational grazing is practiced, but the stand of alfalfa will be maintained better and the yield of TDN will be higher when deferred grazing is practiced, (3) little difficulty from bloat will be experienced when the cows have access to good quality hay, and (4) the vegetation grazed will be palatable and of good quality.

Schoolin'

(*From page* 5)

vary directly with the sums of money spent for teachers and facilities? Expenditures per pupil and teacher salaries remain lower in rural areas, and average attendance is also down in comparison to urban sections. We know that some great strides have been made and hundreds of devoted teachers employed in farming zones—these are evident. Some of the rural states are making greater relative financial efforts to support good public schools than richer industrial states. As more equalization laws are enacted, the principle will be set up soon that the wealth of the whole nation should contribute some to the education of youth wherever they live.

It's still as true as ever that one who is prevented or denied refreshment from the educational reservoir challenges our attention and aid. It's better to provide a fair and equal chance for all, lest some particular persons of high caliber suffer lifelong defeat, and great talent be lost to the community or the nation thereby. I think we can afford to set up these higher levels of opportunity for development, knowing as we do that laggards and shiftless drones likewise enjoy the same chances and add to the overhead cost. I have been to school celebrations where successful celebrities came back to the old spot to receive tribute—and reflect tribute and honor back to the little schools where they first drank their fill and acquired a taste for more.

One who is deprived of a suitable education in schools is not exactly the object of general pity—unless he butts into some technical or classical confab far beyond his depth. His main handicap today is in getting and holding jobs that have been officially keyed to the college or university. He begins to feel that lack financially about the time his kids get more expensive and the shadows of upper middle age creep into his face.

IN agriculture this educational question is harder to answer with definite and positive facts than it is in most city professions. I doubt if we know any too much about the percentage of farmers who either possess or lack higher training in relation to their gross incomes—except here and there in localized studies. We do know that agricultural colleges run an average of 15 to 20 per cent of their graduates as farm operators, and one such study indicates that these graduates engaged in farming have done pretty well for themselves, in comparison with the graduates otherwise employed. The graduate farmer doesn't usually frame his diploma or degree certificate as evidence that he is entitled to "practice." He benefits constantly from college work, but he enjoys no professional academic-farmer societies as such. He exerts his influence and keeps up his current information through cooperatives or agri-

cultural groups where possession of a college degree is hardly ever necessary for membership.

Then, of course, there are other distinct advantages to a college training besides rolling up a bank account bulwark. These have to do with living and being, not just having and saving. Sometimes the non-collegiates develop these sidelines to a well-rounded character as well or better than the graduates. But from studies made at Michigan State College one feels that formal education by itself should always aim to create aptitudes worth cultivating for later success. That is, a degree based only upon subject matter cannot help a lot if the student lacks aptitudes.

THE Michigan school alumni believed the following aptitudes most essential in success on the job:

The ability to get along with folks was voted tops by 36 per cent. Skill in using technical knowledge got the nod of 20 per cent. Ability to get things done—to accomplish what you started—was rated highest by 16 per cent. Thirteen per cent gave the ability to work hard; 10 per cent said "salesmanship" of ideas and products ranked best. Only one per cent mentioned the ability to be active in community services.

You can take that slate off the hook here and apply it to folks with and without a college degree, and you'll get about the same list of aptitudes for success. That is, take ability to get along with people. Ask yourself if that is something all colleges emphasize and train students for? Or, in reverse, does our well-known college of hard-knocks and improvising supply a good, fresh stock of that commodity every day?

The second one—skill in using technical information—naturally gives the one holding a degree the big edge. Sticking to it, working hard, and good salesmanship, as above specified, may or may not be aptitudes that the college engenders. Quite likely, they are

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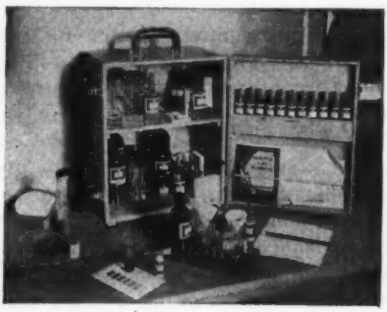
LaMotte Soil Testing Service is the direct result of 30 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils, and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

Methods for the following are available in single units or in combination sets:

Ammonia Nitrogen	Iron
Nitrate Nitrogen	pH (acidity & alkalinity)
Nitrite Nitrogen	
Available Potash	Manganese
Available Phosphorus	Magnesium
Chlorides	Aluminum
Sulfates	Replaceable Calcium

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.



LaMotte Combination Soil Testing Outfit

Standard model for pH, Nitrate, Phosphorus and Potash. Complete with instructions.

Illustrated literature will be sent upon request without obligation.

LaMotte Chemical Products Co.

Dept. BC Towson 4, Md.

facets of character to start with, then polished up by drill and routine at the college.

When it comes to engaging in active community services, one is obliged to concede that the schooling in academic circles with their organized activities and responsibilities fits a man well for that aptitude. However, the alumni in the questionnaire rated it almost nil as a success essential. Probably it could be, if a fellow neglected his own affairs to become a constant organizer and promoter of the public welfare.

AWAY back in the days we were talking about, when schooling was a rare treat and a precious privilege to the few, these same old aptitudes played their part just as they do today.

I guess they also got their aptitudes sort of jumbled up. I had a good uncle who never knew anything much excepting hard, gruelling toil. He had a little technical skill, such as it was, and did his best to apply it to his arduous occupation. He was too weary to enter into community activities, although as a fiddler of sorts, his place would have been secure in society of the time.

I knew another townsman of my era who had some technical ability and got things done by hard work and long hours. He could sell anything to almost anybody—with or without it. But when it came to being agreeable and sociable and making warm friends, he was just a cold fish.

One of my aunts personified the active do-gooder and joiner. Without much education, she succeeded in running things all up and down our valley. She had a robust, genial mien and got along tops with people on all occasions. She also had distinct ability to sell herself and the pet projects she was engineering at the moment. I confess we often grew a trifle tired of Aunt Mercy—and probably we'd have been just as completely worn out had she boasted a diploma from the state university.

Another close relation had many of these sterling aptitudes, mainly those of application and hard work. But she lacked confidence and was timid and shrinking. She magnified her failures and multiplied her fears. I doubt if she was ever serene and stabilized—perhaps hard work got in its licks. She had talent, ability, and skill of homespun kinds. Here maybe the denial of any real education beyond district school narrowed her down and undermined her courage. I don't know if higher learning would have restored what she was denied. Anyhow it's too late for our society to help her that way. She rests with the Great Teacher now.

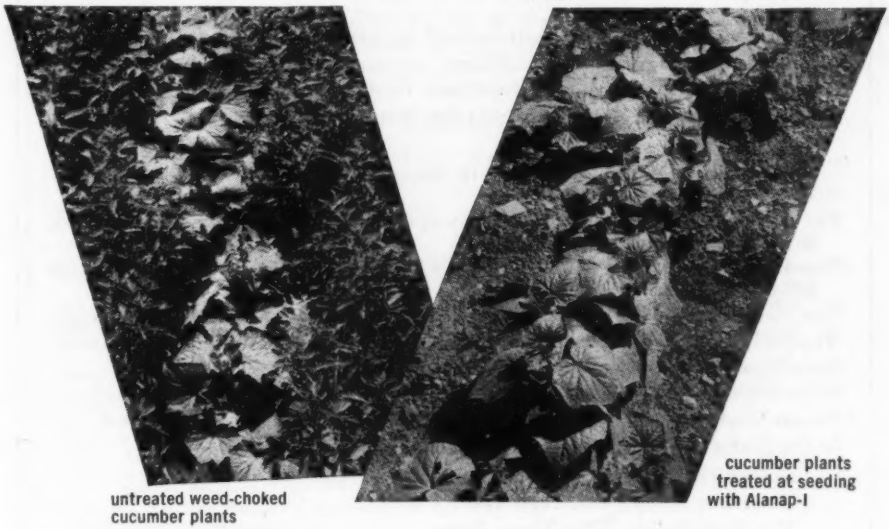
These personalities craved expression. Some of them rose above their starved educational opportunities and contributed about as much to our well-being as many who have enjoyed the extra schooling which those others yearned in vain to get.

If we possess boundless faith and a fair amount of humility, we can survive both insufficient and too efficient education. Doubtless one is almost as troublesome as the other. For instance, we have all tried to read learned tomes about man and nature and humanity and the cosmos and such ponderous themes—only to wind up with less stability and confidence in both the here and hereafter than we had before.

After all, the real educated person is one who seeks to learn from everyone and everything that intrigues him. He develops just as greatly after earning his degree as he did from the chart class to the commencement. Too many of us miss that desirable goal. Too many of us regard a college as a place to get eartagged or branded so that we will command a higher price in the market place.

There are also the three S's in education, coming right after the elementary three R's. To my notion they are: Keep it Sensible, Sound, and Serviceable.

What's new in Naugatuck ✳



untreated weed-choked cucumber plants

cucumber plants treated at seeding with Alanap-I

ALANAP®-I saves vine crop growers up to $150 Per Acre

Extensive field tests prove that Naugatuck's new herbicide, Alanap-1, can save growers of cucumbers, melons and squash countless dollars by practically eliminating hand weeding.

One experiment reveals that *curcurbit yields were actually doubled by a pre-emergence application of Alanap-1.* "Plants in untreated rows were severely stunted by weed competition before the fields could be cultivated and hoed, whereas treated rows were still not suffering... two months after planting."

As a pre- or post-emergence weed killer, Alanap-1 gives excellent control of a wide variety of weeds, is non-hazardous to humans and animals, easy to apply, low in cost, and safe on recommended crops *which now include asparagus.*

✳ **One in a series of advertisements demonstrating Naugatuck's continuing effort to introduce new and better products for agricultural and related uses.**

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producers of seed protectants, fungicides, miticides, insecticides, growth retardants, herbicides: Spergon, Phygon, Aramite, Synklor, MH, Alanap.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)

The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)

The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)

The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)

Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)

Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)

Potash Production in America (Sound, running time 25 min. on 800-ft. reel.)

In the Clover (Sound, running time 25 min. on 800-ft. reel.)

In Canada: The Plant Speaks Thru Deficiency Symptoms

The Plant Speaks, Soil Tests Tell Us Why

The Plant Speaks Thru Tissue Tests

The Plant Speaks Thru Leaf Analysis

Borax From Desert to Farm

Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.

Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.

Department of Visual Instruction, Oregon State College, Corvallis, Oregon.

Bureau of Visual Teaching, State College of Washington, Pullman, Washington.

Canada: Canadian Film Institute, 172 Wellington Street, Ottawa, Ontario.

For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Reprints

28-12-45 Better Corn (Midwest) (Circular)
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
I-2-47 Fertilizers and Human Health
T-4-47 Fertilizer Practices for Profitable Tobacco
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
CC-10-48 Starved Plants Show Their Hunger
OO-11-48 The Use of Soil Sampling Tubes
SS-12-49 Fertilizing Vegetable Crops
BB-8-50 Trends in Soil Management of Peach Orchards
I-3-51 Soil Treatment Improves Soybeans
X-8-51 Orchard Fertilization Ground and Foliage
BB-10-51 Healthy Plants Must Be Well Nourished
II-12-51 Pasture Improvement With 10-10-10 Fertilizer
KK-12-51 Potassium in Animal Nutrition
A-1-52 Research Points the Way to Higher Levels of Peanut Production
E-2-52 Ladino Clover—Its Mineral Requirements & Chemical Composition
H-3-52 The Relative Merits of Inorganic & Organic Sources of Plant Nutrients
L-4-52 Efficient Use of Fertilizer in the Southern Region
O-4-52 Tomato Production for the Canning Industry
Q-5-52 Potassium-nitrogen Balance for High Corn Yields
Y-10-52 The Nutrition of Muck Crops
CC-12-52 The Leaf Analysis Approach to Crop Nutrition
B-1-53 Commercial Fertilizer Is a Sound Investment
I-3-53 Sericea Is a Good Drought Crop
J-3-53 Balanced Nutrition Improves Winter Wheat Root Survival
K-3-53 Kudzu Keeps Growing During Droughts
N-4-53 Coastal Bermuda—A Triple-threat Grass on the Cattleman's Team
P-4-53 Learning How to Make Profits from Sweet Potatoes
S-5-53 More Cotton on Less Land
T-5-53 Trefoil Is Different
W-6-53 The Development of the American Potash Industry
AA-8-53 Strong Roots Make High Corn Yields
CC-10-53 More Effective Fertilizer Use Needed in the Northeast
DD-10-53 Sampling Soils for Chemical Tests
FF-10-53 Testing and Reclaiming Alkali Soils
II-11-53 The Importance of Legumes in Dairy Pastures
JJ-11-53 Boron—Important to Crops
KK-11-53 A Convenient Quick-test for Potash in Coastal Plains Soils
MM-12-53 White Birch Helps Restore Potash-deficient Forest Soils
OO-12-53 General Rules Concerning Plant Nutrients
B-1-54 High-level Fertility Makes Balbo Rye Roots More Effective
C-1-54 Soil Test Summaries Can Be of Value to Many Groups
D-1-54 Relation of Potash and Phosphate to Cold Injury of Moore Pecans
I-2-54 Lime and Fertilizer Pay Off
J-2-54 Feed in the Northeast—Buy It or Grow it?
K-2-54 Soil and Plant Analyses Increase Fertilizer Efficiency
L-2-54 Alfalfa Regains Favor With Tennessee Farmers
M-3-54 Peanut Production Trends in North Carolina
N-3-54 Fertility of Georgia Soils as Shown by Soil Tests
P-3-54 Some Aims of Soil Research
Q-3-54 Fertilize By Test—Not By Guess!
R-3-54 Soil Fertility (Basis for High Crop Production)
S-4-54 So You Want to Grow Alfalfa?
T-4-54 The Fertilization & Liming of Pennsylvania Fruit Soils
U-4-54 Nutrient Balance Affects Corn Yield and Stalk Strength
V-4-54 Tung Culture Finds a Place in South Mississippi
W-4-54 Some Reasons for Poor Crop Stands
X-5-54 Fertilizer Analyses Are on the Move —UPWARD
Y-5-54 Potential of Fertilizer Use for More Efficient Production as Applied to Midwest
Z-5-54 Oregon Can Produce More Strawberries
AA-5-54 The Changing Fertility of New England Soils

THE AMERICAN POTASH INSTITUTE
1102 16th STREET, N. W. WASHINGTON 6, D. C.

A certain corporal had been overseas two years when he received word from his wife of a newly-born son.

Cigars were in order, so he purchased several, and began dispensing them, repeating the news of the blessed event. With one cigar left he entered the lieutenant's office.

After hearing the corporal's story the lieutenant said: "Jones, doesn't it seem strange to you that you have been overseas at least two years and your wife has just now had a baby?"

Jones beamed brightly, "Oh, no sir," was his reply, "There was three years between my brother and me."

* * *

Mother: "Now, Junior, be a good boy in college, wash behind your ears, be careful with your money, write home often, study hard, wear your long underwear, and keep your trap shut."

* * *

The girl who slaps you may not want to hurt your feelings as much as she wants to stop them.

* * *

Rastus: "Yessuh, I done found out that honesty is the best policy after all."

Mose: "How come?"

Rastus: "You remember that dawg I stole last week? Well I tried to sell it for two whole days and nobody would give me more than a dollar for it, so I took it back to the owner and collected the reward. She gave me five dollars."

* * *

A small boy was listening to a convention program when the radio announcer said: "The speaker is now making his way to the rostrum."

"Well, for gosh sakes," exclaimed the youngster, "What does he want to tell that on the air for?"

* * *

Two men on a train were discussing whether they should go to Minneapolis or St. Paul. "I don't want to go to Minneapolis because there are too many Swedes there," said one.

"I guess St. Paul is out, too, then because there are too many Swedes there," replied the other.

An elderly Swedish lady sitting behind them overheard their comments and she spoke up and said:

"Excuse me, jentlemen, but if you are looking for a place var there ain't no Swedes, vy don't you go to hell?"

* * *

Two love-sick Bronx kids at a dance:
"You're dancink?"
"You're askink?"
"I'm askink."
"I'm dancink."

* * *

"Do you pretend to have as good judgment as I have?" exclaimed the enraged wife to her husband.

"Well, no," he replied slowly, "our choice of partners for life shows that my judgment is not to be compared with yours."

* * *

NOW AVAILABLE...

FOR AGRICULTURE! *Here's a natural calcium borate mineral of low solubility for preventing and correcting boron deficiency in light-textured soils and areas of high rainfall! Now we offer a worthy companion product to supplement our popular, but more soluble, Fertilizer Borates...*

Your newest source of Boron for plant foods.

COLEMANITE
HIGH GRADE

COLEMANITE-HIGH GRADE provides lengthy boron nourishment for crops on light and porous soils—or in high rainfall areas. Because of its low water solubility, COLEMANITE is especially suitable for borating general purpose and premium grade fertilizers that may be applied to COTTON and to boron-sensitive crops (i.e.: tobacco, sweet corn, potatoes, beans) which require certain minimum amounts of boron over a season. The release of boron by COLEMANITE is slow and extended—a single application will suffice for a season—and therefore preferable for use on boron-sensitive crops which could be adversely affected by an excessive dosage of boron at one time. COLEMANITE-HIGH GRADE and FERTILIZER BORATES team up to broaden your use of borated fertilizers!

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